

DRAFT ENVIRONMENTAL ASSESSMENT

Reconstruct Routes 10, 15, and 110 Mammoth Cave National Park, Kentucky

Federal Lands Highway Program Packages 900, 901, and 902
Project Management Information System Numbers 22988, 22994, and 23001



DRAFT Environmental Assessment -- “Reconstruct Routes 10, 15, and 110”

ENVIRONMENTAL ASSESSMENT

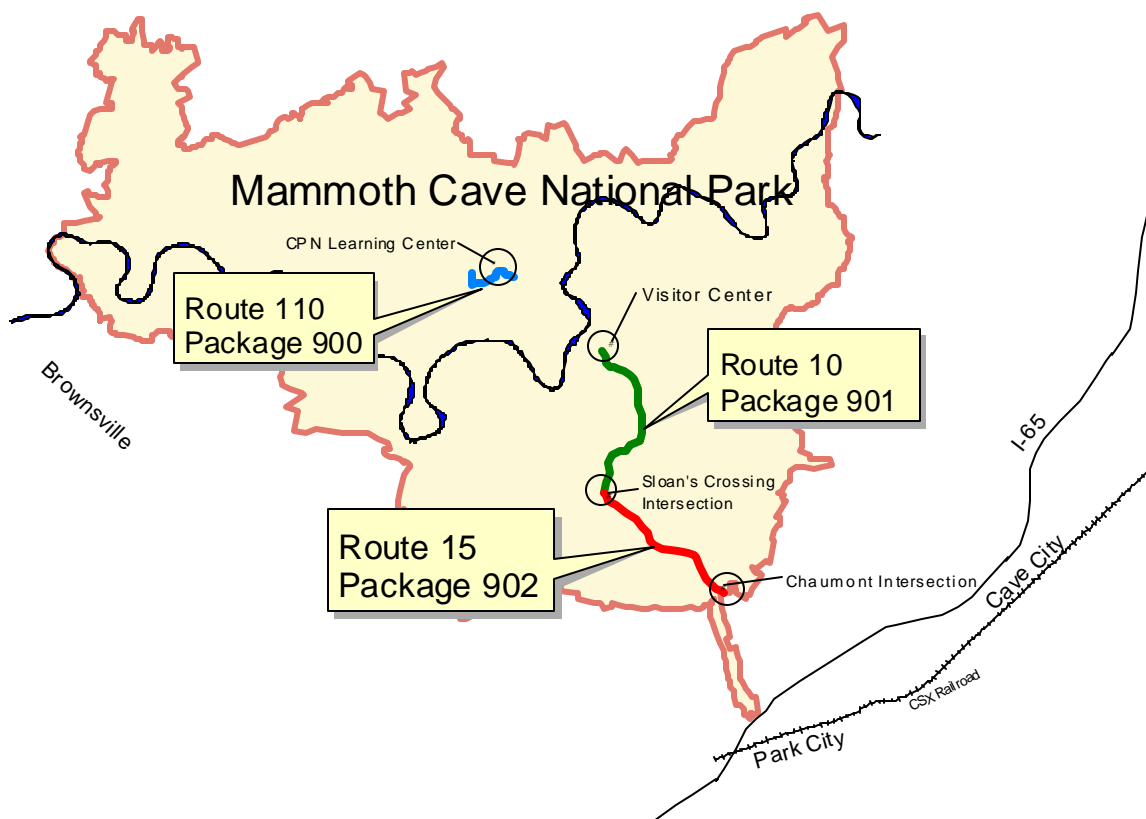
RECONSTRUCT ROUTES 10, 15, AND 110

Federal Lands Highway Program Packages 900, 901, and 902
Project Management Information System Numbers 22988, 22994, and 23001

Mammoth Cave National Park, Kentucky

PURPOSE AND NEED

The purpose of the project is to provide safe access to park facilities. This is primarily a road maintenance project that includes some elements of reconstruction. The proposed reconstruction involves the primary park entrance road between the boundary at Chaumont and the Visitor Center (Routes 10 and 15, 5.65 miles), and the road to facilities at Maple Springs (route 110, 1.0 miles) including the Maple Springs Research Center. In fiscal year 2004, expansion of the Maple Springs Research Center into the Cumberland Piedmont Network Learning Center will begin.¹



Park Map Showing Locations of Routes 10, 15, and 110

¹ The Cumberland Piedmont Network (CPN) Learning Center was selected as the highest National Park Service priority for funding of learning centers in fiscal year 2004.

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The proposal would meet current standards developed by the American Association of State Highway and Transportation Officials (AASHTO). Accident-prone intersections would be reconfigured. New pavement would provide a smooth driving surface.

The purpose of this environmental assessment is to identify and analyze alternatives and their probable effects on the human environment in order to provide a basis for informed decisions. This Environmental Assessment describes the alternatives, the affected environment, and the environmental consequences of each alternative (including the direct, indirect, and cumulative effects of each alternative) and identifies an environmentally preferred alternative. Because this is primarily a highway maintenance project with elements of reconstruction, the basic choice to be made is between the proposal and no action.

This Environmental Assessment is intended to facilitate compliance with the National Environmental Policy Act and various other related administrative and legislative requirements.

BACKGROUND

The proposal is based on studies completed by the Federal Highway Administration (FHWA) in 1998 and in 1992, which identified hazardous intersections, evaluated alternatives, and created recommendations. The planned work on Routes 10 and 15 has been combined into one project with the work on Route 110 being managed as a separate project. The two projects are incorporated into this single environmental assessment because they involve similar work, issues, and impacts.

Routes 10 and 15 were originally constructed in the early 1960's. They are unchanged since that time, but repaving was done in 1980. Route 110, in some form, predates establishment of the park in 1941. At least a dirt road was present before the Civilian Conservation Corps, circa 1933-1942, upgraded it to a limestone gravel surface. In the early 1980's, the road was substantially upgraded (widening and reconstruction of hills and curves) and eventually a chip seal surface was applied. Prior to the 1980's work, there was one location where a standard width school bus could not pass between the two large trees on opposite sides of the road.

EXISTING CONDITIONS

Route 10 connects Route 15 to the park visitor center, hotel, operations area, and administrative offices. Together Routes 10 and 15 form the primary visitor access road between the Visitor Center and I-65. In combination with the improvements in Kentucky Highway 70 (KY70) planned for construction in 2005, there would be a single direct highway link between I-65 at Cave City and the park visitor center. Route 10 is 3.04 miles long and connects the Sloan's Crossing Intersection to the Visitor Center parking lot. Route 10 is fully structurally sound, but the full length of the road needs an overlay of asphalt pavement.



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The Visitor Center parking lot includes 0.44 miles of road and 6.61 acres of surface. The staging area for tours that require bus transportation to remote entrances is located between the Visitor Center and the parking lot. Inspection by the FHWA indicates the surface is in good condition and only needs an overlay. The Mammoth Cave Hotel parking lots also include overflow parking for the Visitor Center. Asphalt covers 0.38 miles of road and 3.1 acres. Inspection also found this parking area to be structurally sound and only in need of overlay.

Route 15 is a critical access avenue into the park. This portion of the highway is 2.6 miles long and receives traffic from I-65 exits at both Park City and Cave City. Inspection by FHWA determined that the full length of this segment needs an overlay and that approximately 10% of the road base needs reconstruction.



View of Chaumont Intersection from the East

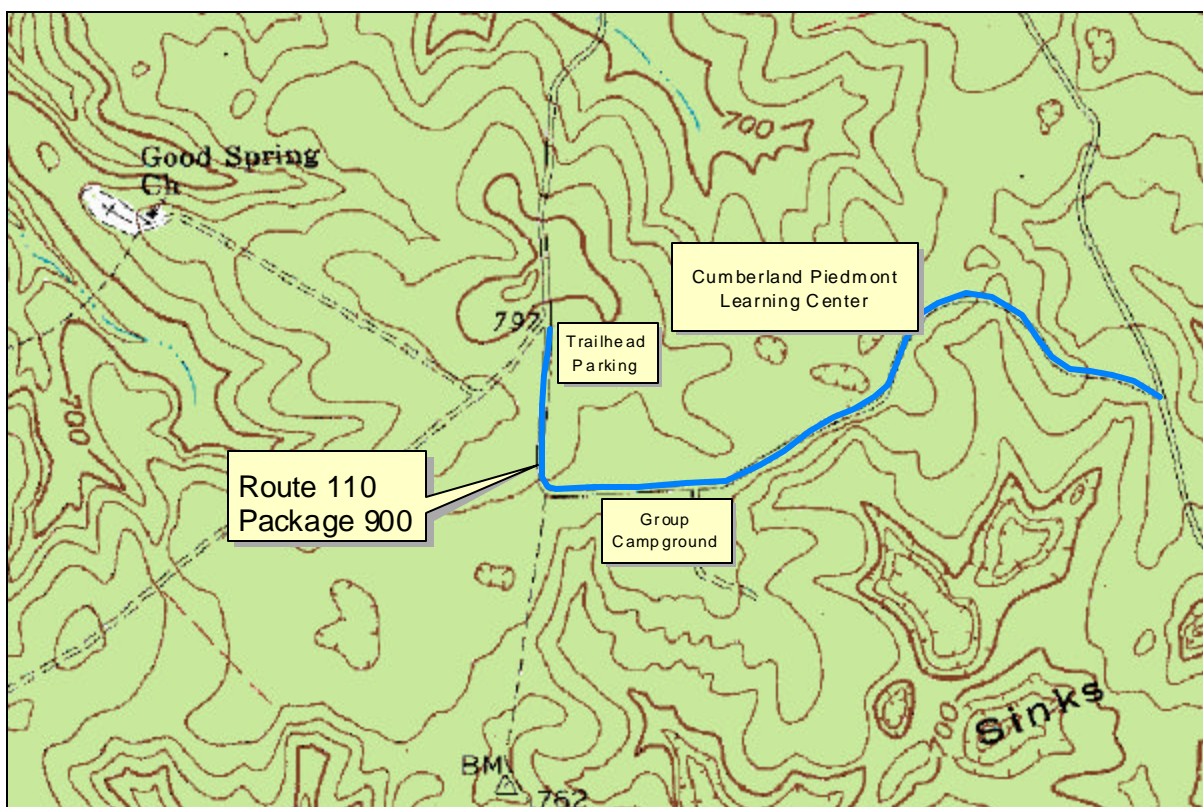


View of Sloan's Crossing Intersection from the East

In order to improve safety and to provide better visitor access to the Visitor Center the intersections at Chaumont and Sloan's Crossing require reconfiguration. Numerous alternatives were developed and analyzed in the 1992 Engineering Study completed by FHWA. The 1992 Engineering Study was completed because of the accident history at this intersection. The Chaumont Intersection is located at the park boundary on Route 15 and connects to KY70 at Chaumont. The through movement at this intersection would be from KY70 toward the Visitor Center.

The Sloan's Crossing intersection also was studied because of the accident history. The configuration of the islands is confusing to drivers and the through movement is away from the Visitor Center. Reconfiguration will realign the intersection with the through movement toward the Visitor Center. The intersection would function along with the other improvements to provide a single direct route from I-65 to the Visitor Center.

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Route 110 is presently a single lane highway that connects the Green River Ferry Road (1352) to the Good Springs Road (109). The Cumberland Piedmont Network Learning Center will be located at the Maple Springs Research Center beginning in 2004. Route 110 also provides access to the Maple Springs Group Campground, which has a capacity of 168 people per night. The Learning Center will be designed to accommodate up to 75 people overnight. The road is 1.0 miles in length and is critical to the planning and success of the Learning Center as well as access to the Group Campground and other recreational resources. From a safety standpoint, the expected increase in daily traffic on this single lane road requires two lanes to meet National Park Service Standards. The intersection with the Green River Ferry Road lacks adequate sight distance. A turnaround must be provided for buses and vehicles pulling horse trailers.



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MANAGEMENT POLICIES FROM NATIONAL PARK SERVICE MANAGEMENT POLICIES, 2001, p. 107.

9.2.1.1 Park Roads

Park roads will be well constructed, sensitive to natural and cultural resources, reflect the highest principles of park design, and enhance the visitor experience. Park roads are generally not intended to provide fast and convenient transportation; rather, they are intended to enhance the quality of a visit, while providing for safe and efficient travel, with minimal or no impacts on natural and cultural resources. For most parks, a road system is already in place. When plans for meeting the transportation needs of these parks are updated, a determination must be made as to whether the road system should be maintained as is, reduced, expanded, re-oriented, eliminated, or supplemented by other means of travel. When roads are chronically at or near capacity, the use of alternative destination points or transportation systems, or limitations on use, will be considered as alternatives to road expansion. Park road designs are subject to NPS Park Road Standards, which are adaptable to each park's unique character and resource limitations. Although some existing roads do not meet current engineering standards, they may be important.

MANAGEMENT OBJECTIVES EXCERPTED FROM THE MAMMOTH CAVE NATIONAL PARK GENERAL MANAGEMENT PLAN (OCTOBER 1983, p. 3-6.)

The aim of management at Mammoth Cave National Park is to perpetuate the integrity and diversity of geologic features and life systems that are associated with the caves, and the aquatic and terrestrial environments, for these have aesthetic, recreational, educational, and scientific values to man.

The management objectives relevant to this proposal are:

- To cooperate with Federal, State, and local government bodies, universities, professional organizations, and interested citizens to ensure that land and water uses within the park environs have minimal adverse effects on park resources, and that public educational and recreational opportunities within and without the park are fully integrated.
- To ensure long-term perpetuation of the cave system, vegetation, wildlife, and other natural resources, and the processes that sustain them, free to the extent possible from the influence of human activities.
- To protect and preserve the park's historic structures, their appearance, and their settings, as well as archeological sites and objects in accordance with legislative and executive requirements and the Service's historic preservation policies.
- To ensure that park development is adequate for efficient park administration and essential visitor services, consistent with the park's purpose, Service policies and other park objectives, and compatible with the special requirements imposed by the cave environment.

MISSION GOALS EXCERPTED FROM THE MAMMOTH CAVE NATIONAL PARK STRATEGIC PLAN, 2001-2005 (APRIL 2000, p. 6)

Mission Goal Ia: The park's natural and cultural resources are managed as defined by legislation within the context of its status as a World Heritage Site and International Biosphere Reserve.

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Mission Goal IIa: Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities .

NATIONAL PARK SERVICE MISSION STATEMENT

The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration, of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resources conservation and outdoor recreation throughout this country and the world.²

MAMMOTH CAVE NATIONAL PARK MISSION STATEMENT

The mission of Mammoth Cave National Park is to protect and preserve for the future the extensive limestone caverns and associated karst topography, scenic riverways, original forests, and other biological resources, evidence of past and contemporary lifeways; to provide for public education and enrichment through scientific study; and to provide for development and sustainable use of recreation resources and opportunities.³

PARK SIGNIFICANCE

Mammoth Cave National Park, designated as a World Heritage Site and an International Biosphere Reserve, is internationally renowned because:

- The many types of geologic features are the product of a unique set of conditions found nowhere else.
- It contains a part of the longest known cave system in the world.
- The park and the surrounding area is believed to support the most diverse cave biota in the world, with more than 130 species of fauna, of which 14 species are found nowhere else.
- The saltpeter works in Mammoth Cave are the best example of a technology that was important in the early history of the United States.
- Mammoth Cave is the core of one of the best-understood karst areas in the world.
- Mammoth Cave contains an unusual variety of ecological niches that provide habitat for an abundance of plants and animals, including 11 endangered species.
- Mammoth Cave contains a rich diversity of flora reflected in remnant prairie and old growth communities.
- Mammoth Cave contains a quantity of primary cultural resources, which have been valuable in the understanding of human interaction with the natural environment prehistorically from the paleo-Indians to the Mississippian period, and historically from early settlement (1774-1825) to the depression era (1929-1941).
- The park provides an abundance of recreation opportunities, surface and subsurface.

² Strategic Plan: National Park Service. U.S. Department of The Interior, National Park Service. January 2000, page 10.

³ Mammoth Cave National Park Strategic Plan, 2001-2005 (April 2000, p. 2)

ALTERNATIVES

There are two basic alternatives presented here, i.e., “no action” and the proposal. The proposal consists primarily of highway maintenance, i.e., repaving roads and parking areas, with four elements of reconstruction. The basic decision to be made is whether to select for implementation the discrete elements of the proposal or elect the “no action” alternative.

Variations in the design of the intersections were considered by the Federal Highway Administration in development of their recommendations. The variations involve different intersection configurations without a change in the location of the intersection itself, and do not involve any reasonably discernable differences in the intensity or nature of impacts. The differences are in the safety and functionality of the finished product. Design variations are not considered discrete alternatives. Therefore, the proposal for each of the elements of work is presented as a sub-alternative of the proposal.

Drawings are attached that show the areas where reconstruction is proposed. Those drawings also indicate the existing configuration of the roads in those areas. Drawings are not included for those areas where the work is repaving with no change in other highway characteristics.

ALTERNATIVE A: NO ACTION

This alternative would retain the current situation. Current deficiencies would not be corrected. The access to the Maple Springs Research Center (Route 110) would remain a one-lane gravel road, and it would not be reconstructed as a two-lane paved road. Routes 10 and 15 would not be repaved and they would continue to deteriorate. The amount of base failure and future reconstruction would increase. The Chaumont and Sloan’s Crossing intersections would be retained in their current configuration. The access to the Tour Staging Area would not be constructed.

ALTERNATIVE B: THE PROPOSAL (The Park Preferred and Environmentally Preferred Alternative)

Sub-Alternative B1 – Reconstruct Route 110 (See drawings on pages 10-14.)

The Maple Springs Road would be reconstructed as a two-lane asphalt paved road from its intersection with the Green River Ferry Road to the current trailhead parking area. The reconstruction would create a two-lane road with a total paved width of 22 feet. The road shoulders would be three feet wide. The intersection with the Green River Ferry Road and a connecting segment would be relocated to the top of the hill to correct the existing inadequate sight distance. The abandoned segment would be reclaimed. The radius of the curve west of the Group Campground would be lengthened. A turnaround loop for larger vehicles, especially buses and vehicles towing horse trailers, would be created using the existing trailhead parking area. The footprint of the road would be widened from the current 12-18 feet to 28 feet. Otherwise, the existing alignment would be retained.

Sub-Alternative B2 – Reconstruct and Reconfigure Sloan’s Crossing Intersection (See drawings on pages 19-20.)

The current intersection has three primary problems. Approaching from the north, there is a hill crest that creates inadequate sight distance. Approaching from the east, the turn toward the Visitor Center does not have a uniform radius. The through movement is away from the Visitor

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Center. The reconfigured intersection would provide a through movement toward the Visitor Center with a curve of uniform radius, and the sight distance problems would be corrected.

Sub-Alternative B3 – Reconstruct and Reconfigure Chaumont Intersection (See drawings on pages 21-23.)

In 1967, the intersection was changed as part of the construction of Interstate Highway 65 (I-65). The changes in traffic patterns anticipated to result from the construction of I-65 have not occurred. The intersection would be returned to its pre-1967 configuration. The Chaumont Intersection would be reconfigured to provide a smooth transition with the Kentucky Transportation Cabinet project to improve Kentucky Highway 70 (KY70). The through movement for traffic entering the park would be toward the Visitor Center and toward Cave City for traffic exiting the park. East of the intersection the road would be widened to accommodate a center turning lane and approach for traffic turning toward the south. The road would also be shifted northward up to 50 feet to provide a smooth transition with the KY70 project.

Sub-Alternative B4 – Construct New Tour Staging and Hotel Access Road (See drawing on page 24.)

Reconstruction of the Visitor Center (Package # 171) includes relocation of the tour staging area. This sub-alternative involves construction of a new access road to the tour staging. This access road would be combined with a new access road to the Mammoth Cave Hotel to avoid creation of an additional intersection in a congested area. The Tour Staging Area access is used by buses that transport visitors to and from remote cave entrances used by some tours. The buses are operated by a concessionaire. This alternative would facilitate the tour operations and improve the function of the new Visitor Center.

Sub-Alternative B5 – Repave Routes 10 and 15 and the Visitor Center and Hotel Parking Areas. (See drawings on pages 16-18)

Routes 10 and 15 and the parking areas at the Visitor Center and the Mammoth Cave Hotel would be repaved. Curbs would be reconstructed in the parking areas and necessary and appropriate striping and signs would be installed in all areas. Repaving of the parking areas would contribute to the proper function of the stormwater filtration systems (Package 187) that are planned for installation in 2003.

ALTERNATIVES CONSIDERED AND DROPPED FROM FURTHER CONSIDERATION

In general, many variations could be considered including construction of an entirely new road. A new road is not a viable alternative because of the obvious resource impacts that would be associated with such a project and because of the obviously higher financial cost. The two alternatives, which were suggested and dropped from further consideration, are discussed below.

Pave the Entire Maple Springs Loop

The potential to pave the entire Maple Springs Loop, which includes the Maple Springs Road and a portion of the Buffalo Road also called the Good Spring Church Road, was discussed. Because the Good Spring Church Road is hilly and the excavation required to meet grade standards for large vehicles including buses and vehicles pulling horse trailers would result in extensive impacts to natural and cultural resources, this alternative was deemed not viable. The expense would also be much greater.

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Upgrade the Cave City Road to Connect to the KY70 Project

The Cave City Road could be reconstructed as the primary access road to the Visitor Center. Routes 10 and 15 were constructed to a higher standard in the early 1960's to provide the primary access to the Visitor Center. There would be a high financial and resource cost to reconstruction the Cave City Road to the same standard. The level of traffic does not warrant having two roads of this standard only one mile apart. This alternative was considered in the 1950's and early 1960's. The decisions made at that time determined both the route of Interstate 65 and the primary access to the Visitor Center (i.e., Routes 10 and 15).

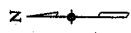
SELECTION OF THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

Identification of the “environmentally preferred alternative” is based on evaluation of the direct, indirect, and cumulative impacts on park resources.⁴ Cost is not a factor in the selection of the environmentally preferred alternative. The preferred alternative is the alternative that best protects the biological and physical environment in keeping with the national environmental policy as expressed in the National Environmental Policy Act (NEPA) § 101 (b). The “proposal,” unless public and agency review reveals information or options that has not been considered, is identified as the environmentally preferred alternative for the following reasons.

- Motor vehicles accidents frequently result in leakage of fluids that can be damaging to the cave ecosystem. The proposal improves safety and reduces the probability of accidents that could result in pollution of the cave ecosystem.
- Overlay of the parking areas improves the function of the stormwater management and filtration systems that remove various pollutants, especially heavy metals, which can be toxic in the cave ecosystem.

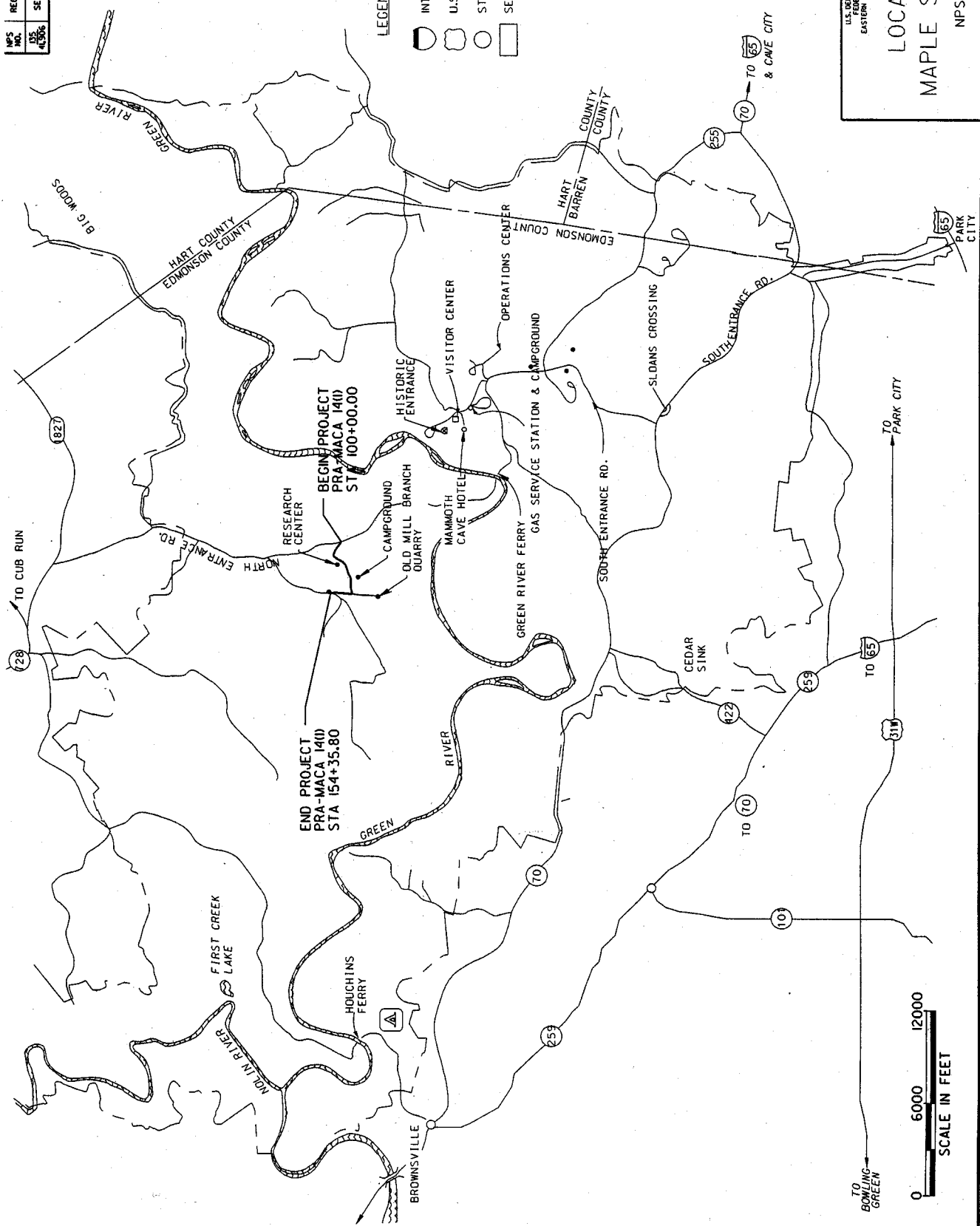
⁴ See Director's Order #12, Conservation Planning, Environmental Impact Analysis, and Decision Making (§ 2.7, D)., January 2001, p. 22.

NPS NO.	REC STATE	PROJECT	SHEET NO.	TOTAL SHEETS
4256	SE KY	PRA-MACA 1410	2	72



LEGEND

- INTERSTATE ROUTE
- U.S. ROUTE
- STATE ROUTE
- SECONDARY ROUTE



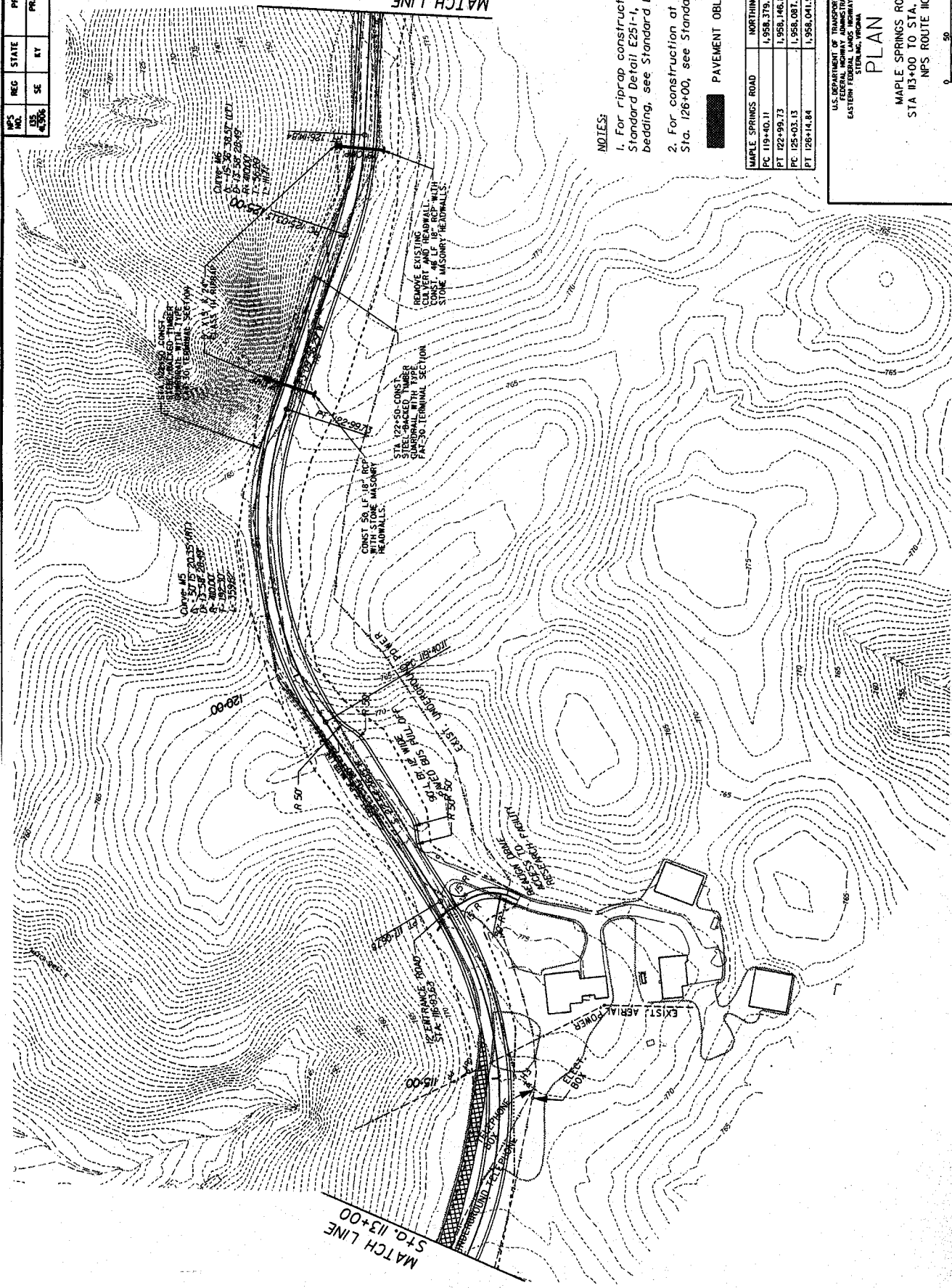
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN DISTRICT OFFICE
STERLING, VIRGINIA

LOCATION MAP
MAPLE SPRINGS ROAD

NPS ROUTE 110



NO.	REG.	STATE	PROJECT	SHEET	TOTAL
103	SE	VT	PR-1000	29	72
103	SE	VT	PR-1000	29	72



- NOTES:
1. For riprap construction, see Standard Detail E251-1, for culvert bedding, see Standard Detail 602-3.
 2. For construction at inlet to culvert Sta. 126+00, see Standard Detail 602-6.
- PAVEMENT OBLITERATION AREA

MAPLE SPRINGS ROAD	NORTHING	EASTING
PC 119+40.11	1,958,379.6932	1,529,103.5070
PT 122+99.73	1,958,146.8700	1,528,844.5870
PC 125+03.13	1,958,081.9640	1,528,649.9030
PT 126+14.84	1,958,041.5360	1,528,548.8800

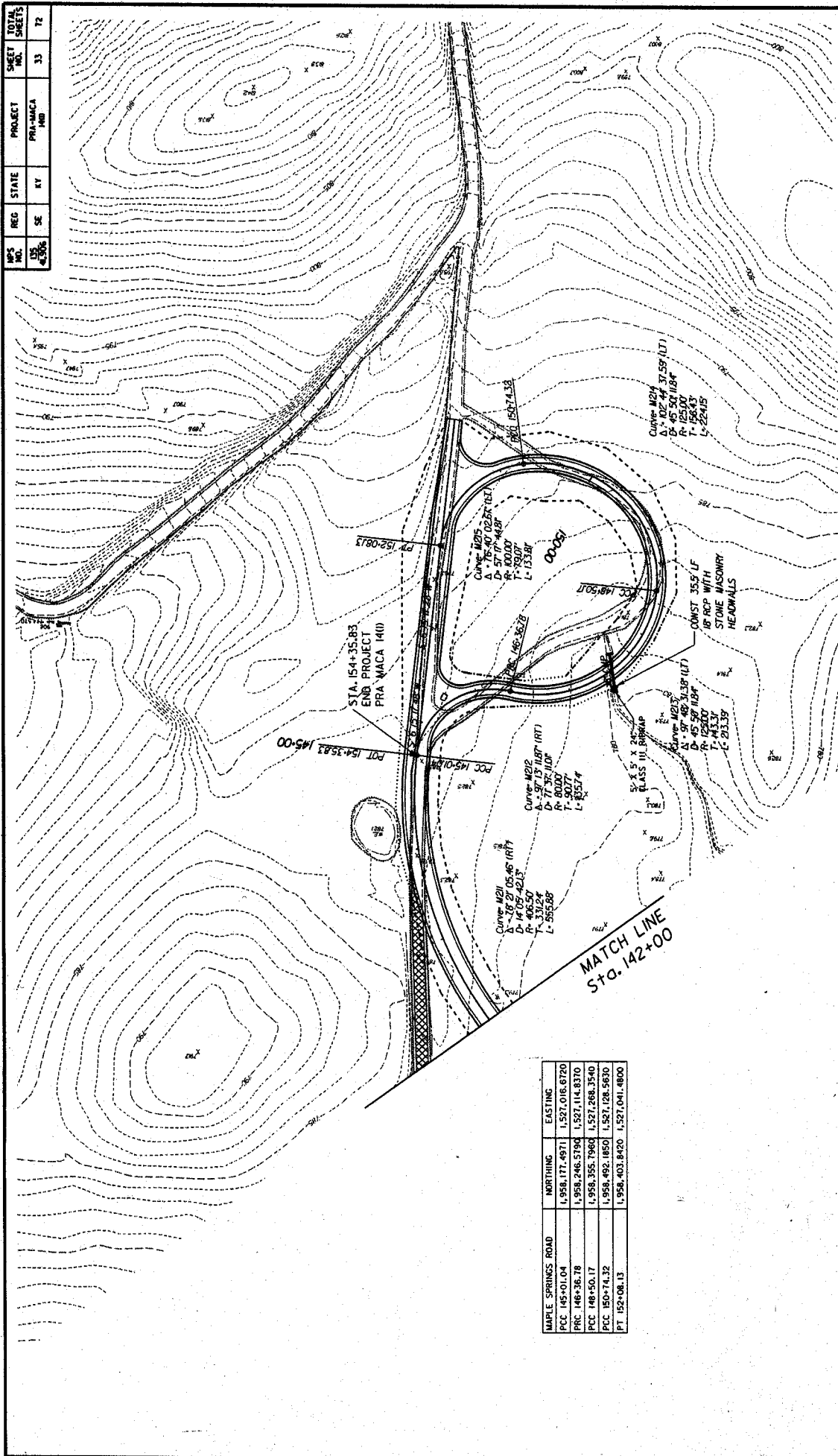
U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION
 EASTERN FEDERAL LANDS HIGHWAY DIVISION
 STERLING, VIRGINIA

PLAN

MAPLE SPRINGS ROAD
 STA 113+00 TO STA 127+50
 NPS ROUTE 110

0 50 100
 FEET

NPS NO.	REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
154-00	SE	KY	PRA-MACA 1410	33	72



MAPLE SPRINGS ROAD	NORTHING	EASTING
PCC 145+01.04	1,958,177.4971	1,527,016.6720
PCC 146+36.78	1,958,246.5794	1,527,114.8370
PCC 148+50.17	1,958,355.7960	1,527,268.3540
PCC 150+74.32	1,958,492.1850	1,527,128.5630
PT 152+08.13	1,958,403.8420	1,527,041.4800

U.S. DEPARTMENT OF TRANSPORTATION
KENTUCKY DIVISION OF HIGHWAYS
EASTERN FEDERAL LANDS HIGHWAY DIVISION
STERLING, KENTUCKY

PLAN

MAPLE SPRINGS ROAD
STA 142+00 TO 154+35.83
NPS ROUTE 110

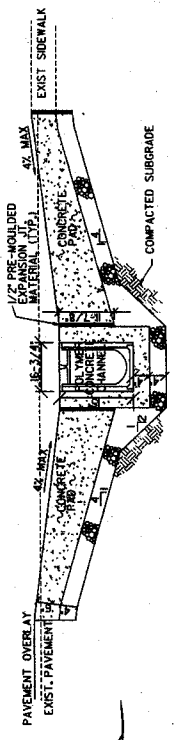
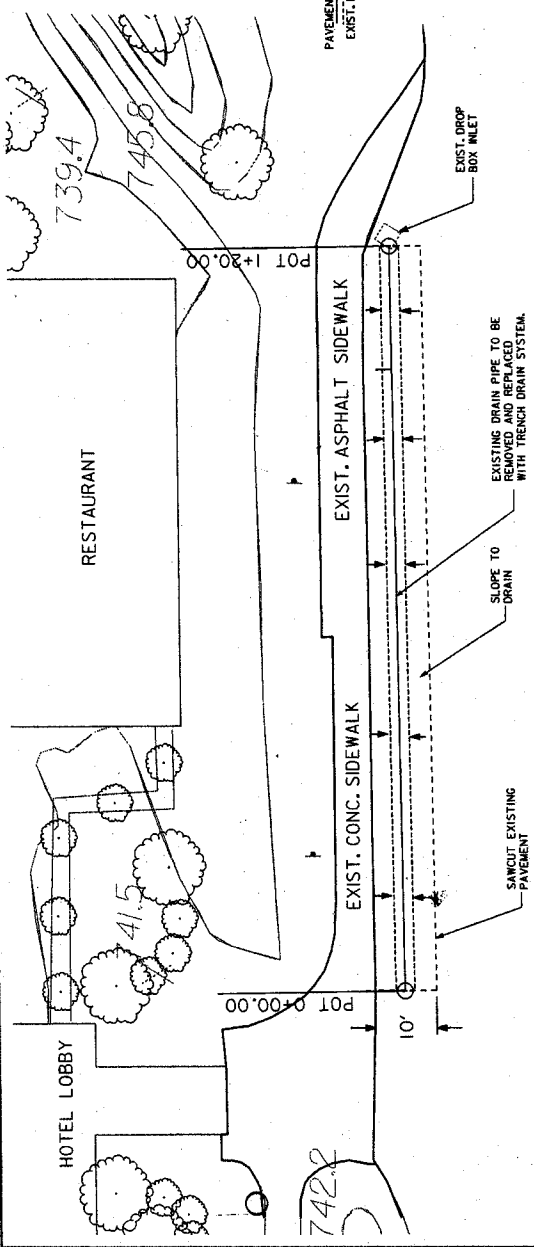
SCALE IN FEET
0 50 100

NOTES:

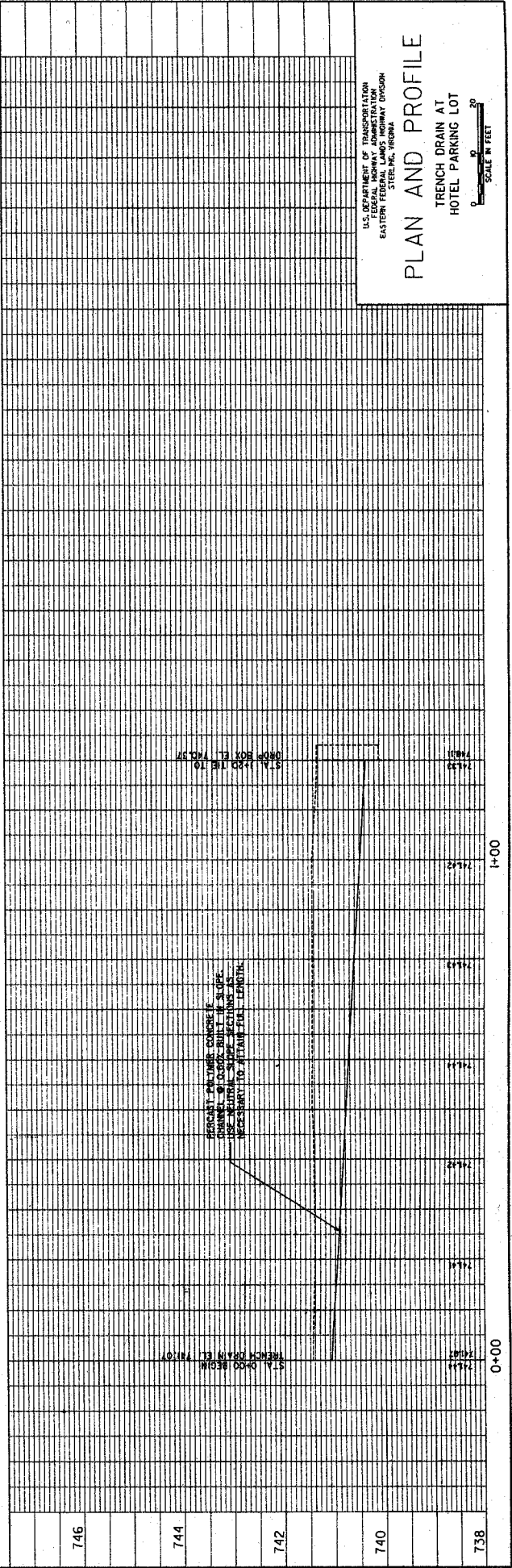
1. For riprap construction, see Standard Detail E25-1 for culvert bedding, see Standard Detail 602-3.

PAVEMENT OBLITERATION AREA

NPS NO.	REC SE	STATE KY	PROJECT	SHEET NO.	TOTAL SHEETS
			PR4-MACA RD.3, 500	33	



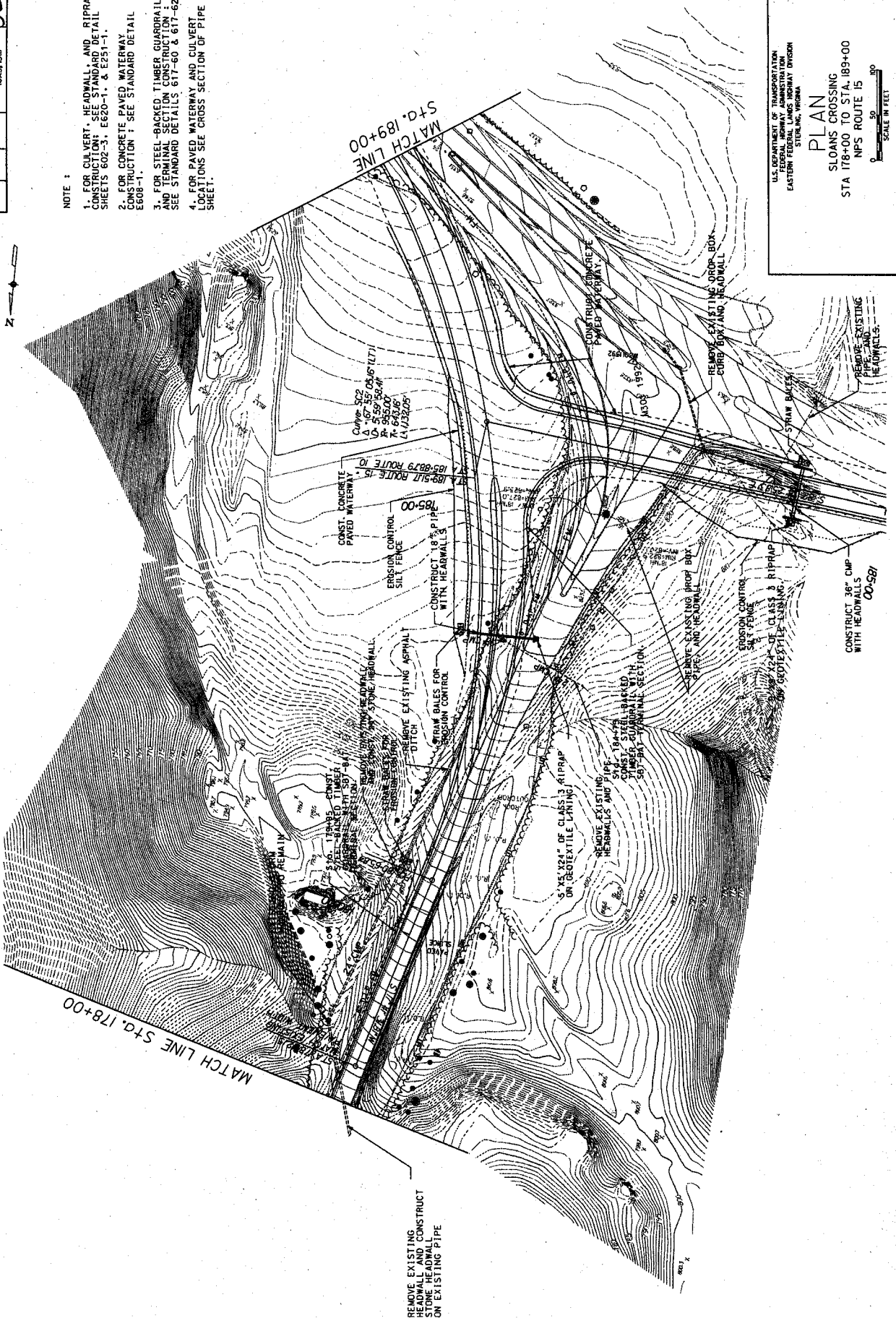
TYPICAL SECTION
TRENCH DRAIN INSTALLATION
NOT TO SCALE



NPS NO.	REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	SE	KY	PRA-MACA 10A3.150	52	

NOTE :

1. FOR CUB VERT. HEADWALL AND RIPRAP CONSTRUCTION; SEE STANDARD DETAIL SHEETS 602-3, E620-1, & E251-1.
2. FOR CONCRETE PAVED WATERWAY CONSTRUCTION; SEE STANDARD DETAIL E608-1.
3. FOR STEEL-BACKED TIMBER GUARDRAIL AND TERMINAL SECTION CONSTRUCTION; SEE STANDARD DETAILS 617-60 & 617-62.
4. FOR PAVED WATERWAY AND CULVERT LOCATIONS SEE CROSS SECTION OF PIPE SHEET.



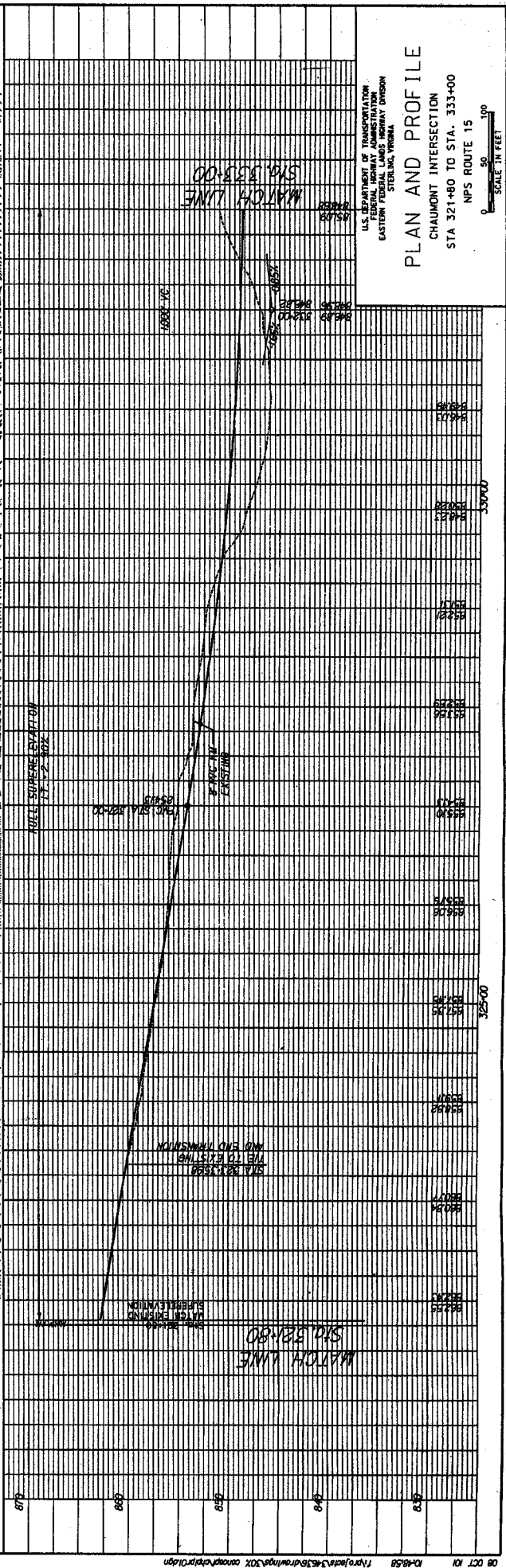
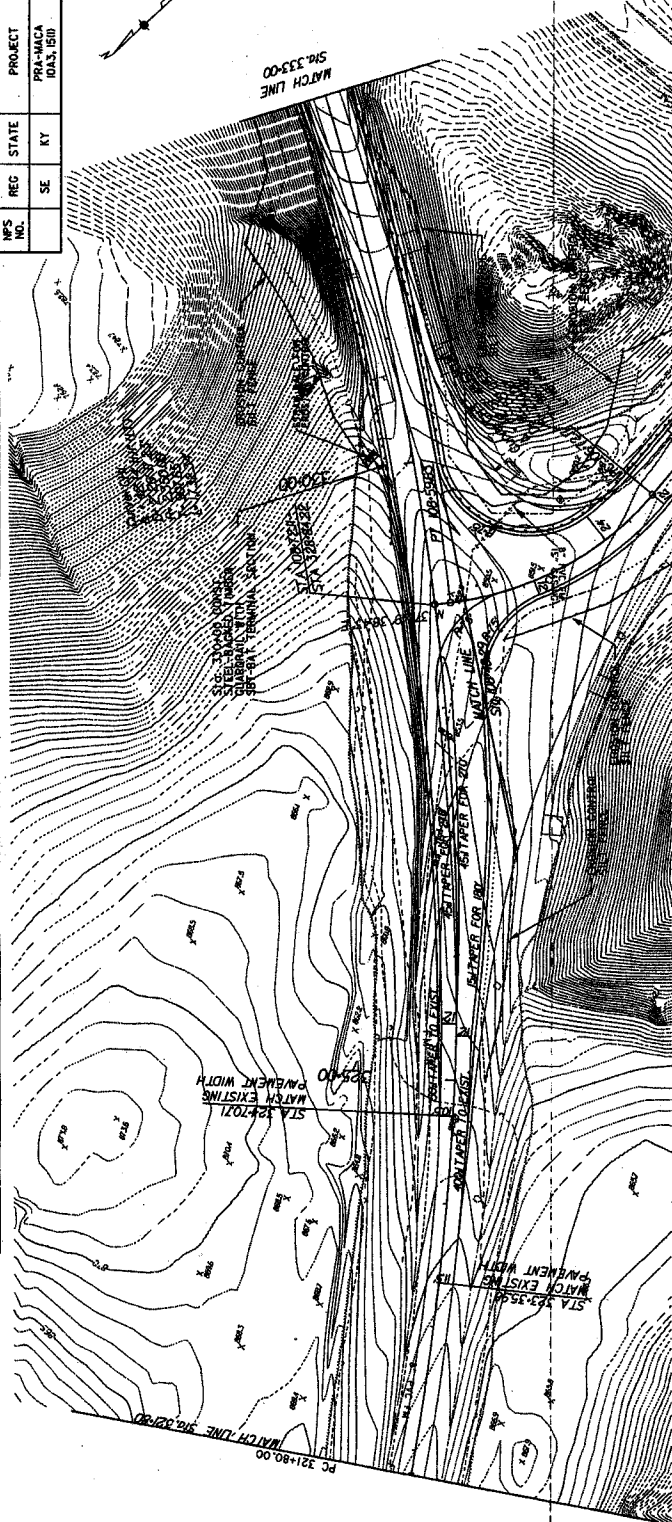
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
STERLING, VIRGINIA

PLAN

SLOANS CROSSING
STA 178+00 TO STA. 189+00
NPS ROUTE 15

SCALE IN FEET
0 50 100

NPS NO.	REG.	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	SE	KY	PRA-MACA RD.3, 500	67	

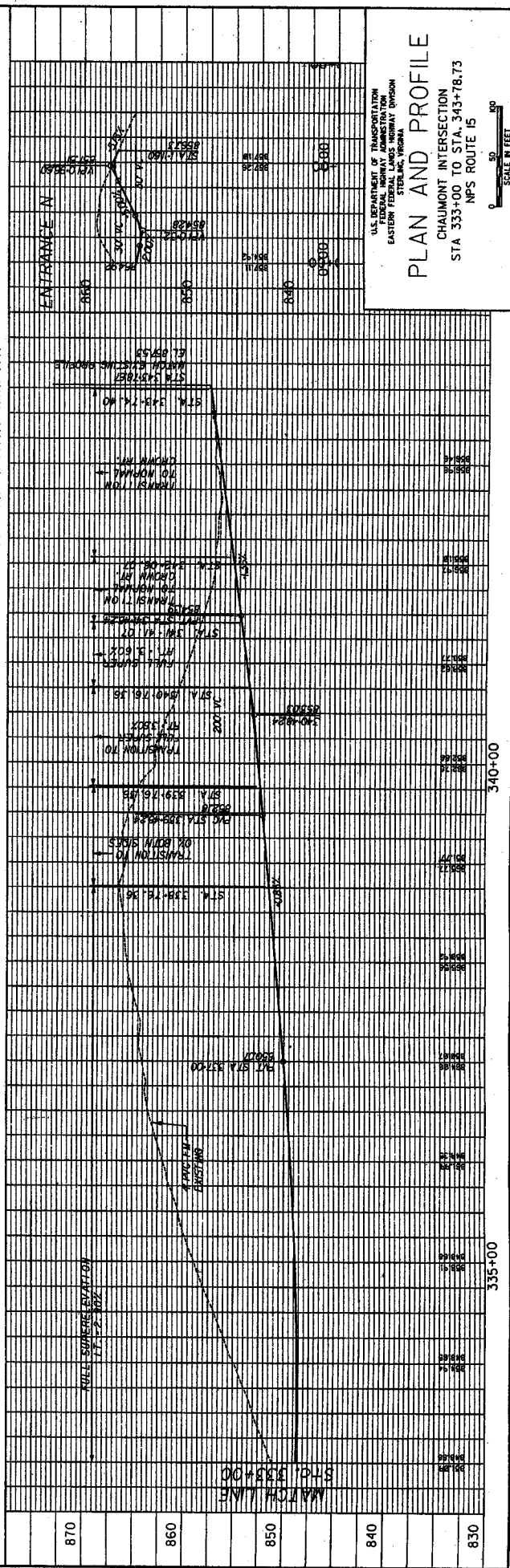
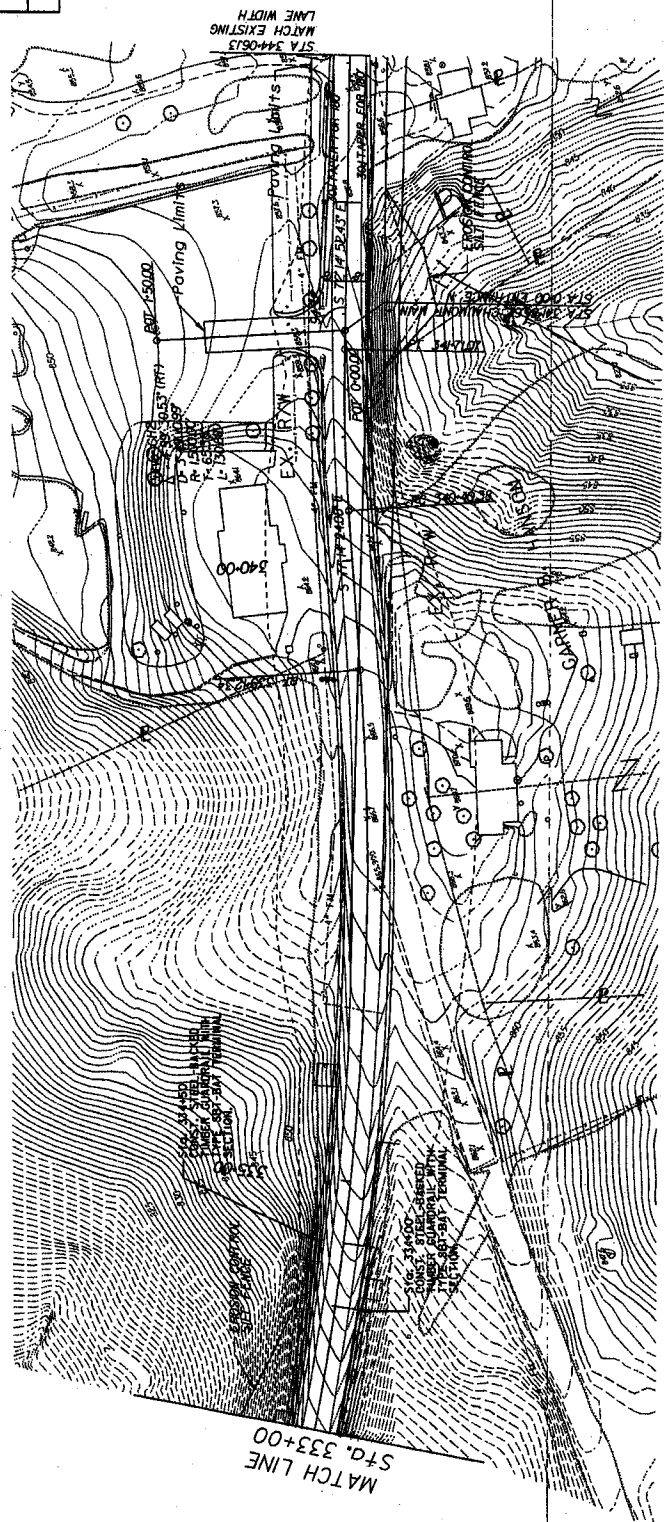


U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION
STERLING, VIRGINIA

PLAN AND PROFILE
CHAUMONT INTERSECTION
STA 321+80 TO STA. 333+00
NPS ROUTE 15

SCALE IN FEET
0 50 100

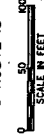
NPS NO.	REG.	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	SE	KY	PRINCE GEORGE	68	68



U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION
 EASTERN FEDERAL HIGHWAY DIVISION
 STERLING, VIRGINIA

PLAN AND PROFILE

CHAUMONT INTERSECTION
 STA 333+00 TO STA. 343+78.73
 NPS ROUTE 15



SHEET NO.	STATE	PROJECT	TOTAL SHEETS
34	MD	MDA-MACA	34
SE	MD	MDA-MACA	

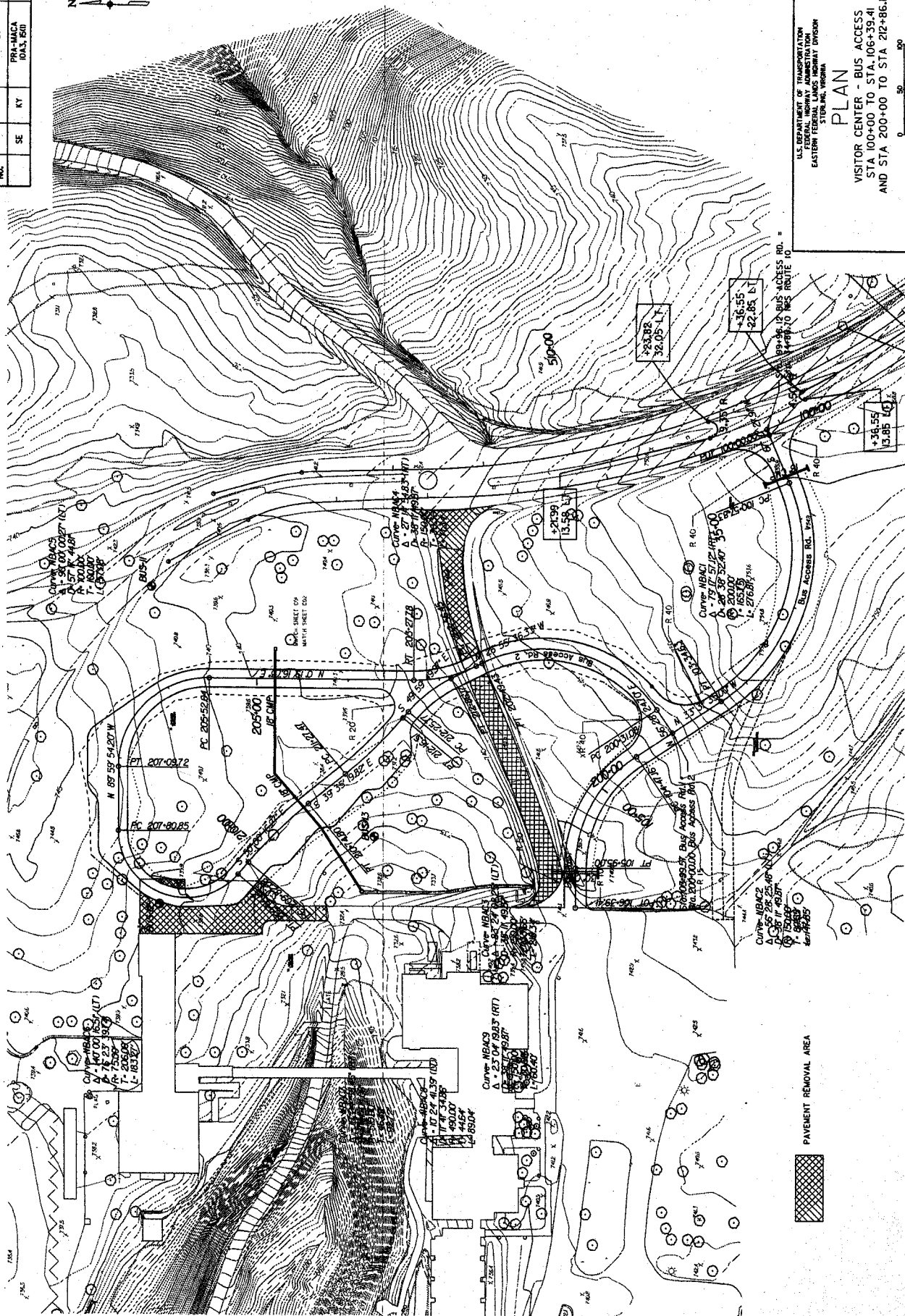


U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS DIVISION
STATION, VIRGINIA

PLAN

VISITOR CENTER - BUS ACCESS
STA 100+00 TO STA. 106+39.41
AND STA 200+00 TO STA 212+86.17

SCALE 1" = 40'



PAVEMENT REMOVAL AREA



AFFECTED ENVIRONMENT

THE PARK IN GENERAL

Mammoth Cave National Park is located in south central Kentucky, in the counties of Edmonson, Barren, and Hart. The park is within the Second Congressional District.

In establishing Mammoth Cave National Park, Congress relied heavily on the recommendations of the Southern Appalachian National Park Commission incorporating it into Senate Report No. 823 which in turn was referenced in the Act establishing the park. The Commission recommended that the park contain 70,618 acres including the extensive limestone caverns and associated topography, portions of the Green and Nolin rivers, and a substantial segment of the rugged landscape north of Green River. The Commission stated that the area containing these features offered

"exceptional opportunity for developing a great national recreational park of outstanding service in the very heart of our nation's densest population and at a time when the need is increasingly urgent and most inadequately provided for."⁵

Today the park encompasses 52,830 acres acquired by a combination of donations and public and private funds.

Mammoth Cave National Park contains the world's longest known cave system and offers internationally renowned examples of karst topography. Many types of cave formations are present within the extensive 360 plus mile cave system. The park is part of what is believed to be the most diverse cave ecosystem in the world. Of the more than 130 species of fauna within the cave system, fourteen species of troglobites or troglaphiles are known to exist only within Mammoth Cave and other caves in the immediate vicinity. Many of these species have been isolated from other cave systems for over a million years, resulting in fragile and unique populations. One of these species is the federally endangered Kentucky Cave Shrimp Palaemonias ganteri. Water of the proper quality and quantity is essential to preserving life within the cave system.

In addition to the world renowned cave system, the park is noted for its outstanding scenic rivers, valleys, bluffs, forests, and abundant wildlife. The park includes twenty-five miles of the Green River and six miles of the Nolin River. The Green River supports a diverse freshwater mussel population including seven federal endangered species in addition to its role as the master stream controlling the geologic development of Mammoth Cave and its unique ecosystem.

On October 27, 1981, Mammoth Cave National Park was listed by the United Nations Educational Scientific and Cultural Organization (UNESCO) as a World Heritage Site and on March 27, 1990 as an International Biosphere Reserve. In April 1996, the Mammoth Cave Area Biosphere Reserve was officially extended and now includes lands within Barren, Butler, Edmonson, Hart, Metcalfe, and Warren counties in Kentucky.

⁵ “Final Report of the Southern Appalachian National Park Commission to the Secretary of the Interior, June 30, 1931.” United States Government Printing Office. 1931, page 18.

NATURAL RESOURCES

Ecosystems

On a landscape scale, there are three functioning ecosystems in the Mammoth Cave Region including the cave ecosystem, which can be subdivided into aquatic and terrestrial components, the riverine ecosystem, which can be subdivided into sinking streams and base-level rivers, and the forest ecosystem, which is composed of several communities. Locally there are remnants of the prairie or barrens ecosystem that existed in the vicinity of the park prior to 1800.

Sinking streams and cave streams are part of the river continuum since they are tributaries of base-level rivers via springs. These distinct but connected aquatic ecosystems are energetically supported by inwashed organic debris from the forest and former barrens ecosystems. Food transport is usually down gradient, but natural backflooding from the river ecosystem through springs into the lower cave streams is also important.

The terrestrial cave ecosystem is also dependent upon the forest ecosystem for its food base. The importation of food is mostly accomplished by cave crickets, bats, and packrats which feed outside, and use caves for refuge where their guano accumulates. Relatively minor amounts of organic material enter the terrestrial cave ecosystem either as flood deposits in normally dry passages, by washing in through entrances, or carried in by raccoons that enter caves to feed and leave their scat.

The Green River, and its tributary Nolin River, flows 25 and 7 miles respectively through the park. These base-level streams possess one of the most diverse fish (82 species) and invertebrate faunas (51 species of mussels alone) in North America. An unused navigation dam (Lock and Dam 6) just beyond the downstream park boundary interrupts normal flow of 16 miles of the Green River and all of the Nolin River within the park. Habitats for eight federally listed endangered species are seriously degraded through reduction of natural flow velocity and resultant siltation. The seven mussel species that are federally endangered are effectively excluded from the Lock and Dam 6 impoundment because the impounded waters do not meet their habitat requirements.

Transitional between the Oak-Hickory Forest Region to the west, and the Mixed Mesophytic Forest Region to the east and north, Mammoth Cave National Park contains portions of each. With over 1,000 species of flowering plants, including 84 species of trees, the diversity within plant communities is high. Forest communities in the patchwork of karst terrain largely differentiate along moisture gradients governed by proximity to surface streams and ponds, which is largely determined by bedrock geology and soil structure. Physiographic factors such as slope and aspect also govern the range of moisture extremes through the seasons. Cedar Glades and Barrens naturally occur on steep dry limestone slopes that face south and southwest, and on disturbed sites. On moderately dry sites near ridgetops, Chestnut Oak and Red Maple are found. Under the mesic conditions found on lower slopes, in the bottoms of narrow karst valleys, and the relatively level terrain on top of plateau fragments, oaks, Hickories, American Beech, Tulip Poplar, and Maples sort according to local conditions. Juniper, Virginia Pine, and Blackjack Oak largely dominate former farm fields. At the wettest end of the moisture spectrum, Hemlock and Umbrella Magnolia occur in deep sandstone gorges, and on river floodplains Sycamore, Box Elder, and River Birch occur.

Most of the forest growth within the park is secondary, and very similar in size and age structure. The "Big Woods" area, however, has never been logged and contains old growth stands of white

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oak, black oak, tulip poplar, beech, and maple. The "Big Woods" is recognized as a State Natural Area by the Commonwealth of Kentucky and is one of the largest remaining stands of old growth forest in the state.

Endangered Species

The park is located in portions of Barren, Edmonson, and Hart Counties in Kentucky. The species considered in this document were identified by the U.S. Fish and Wildlife Service as known to occur or with the potential to occur within Mammoth Cave National Park.⁶ Species contained in the list which have no known presence within the park are indicated by insertion of (NP) following the common name, and they are not considered in the analysis of environmental consequences.

Listed Endangered Species

Indiana Bat	<i>Myotis sodalis</i> ⁷
Gray Bat	<i>Myotis grisescens</i>
Red-cockaded Woodpecker (NP)	<i>Picoides borealis</i>
Bachman's Warbler (NP)	<i>Vermivora bachmanii</i>
Kirtland's Warbler (NP)	<i>Dendroica kirtlandii</i>
Kentucky Cave Shrimp	<i>Palaemonias ganteri</i> ²
Rough Pigtoe Pearly Mussel	<i>Pleurobema plenum</i>
Clubshell	<i>Pleurobema clava</i>
Ring Pink	<i>Obovaria retusa</i>
Fanshell	<i>Cyprogenia stegaria</i>
Pink Mucket Pearly Mussel (NP)	<i>Lampsilis orbiculata</i>
Northern Riffleshell	<i>Epioblasma torulosa</i>
Orange-footed Pearly Mussel (NP)	<i>Plethobasus cooperianus</i>
Cumberlandian Combshell (NP)	<i>Epioblasma brevidens</i>
Fat Pocketbook (NP)	<i>Potamilus capax</i>
Tubercled-blossom Pearly Mussel	<i>Epioblasma torulosa torulosa</i>
Purple Cat's Paw Pearly Mussel	<i>Epioblasma torulosa sulcata</i>
Cracking Pearly Mussel (NP)	<i>Hemistena lata</i>

Listed Threatened Species

Bald Eagle	<i>Haliaeetus leucocephalus</i>
Eggert's Sunflower	<i>Helianthus eggertii</i>
Price's Potato Bean (NP)	<i>Apios priceana</i>

Proposed Species

Scaleshell (NP)	<i>Leptodea leptodon</i>
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Candidate Species

Surprising Cave Beetle	<i>Pseudanophthalmus inexpectatus</i>
Beaver Cave Beetle (NP)	<i>Pseudanophthalmus major</i>
Clifton Cave Beetle (NP)	<i>Pseudanophthalmus caecus</i>

⁶ Personal Communication, James Widlak, U.S. Fish and Wildlife Service, Kentucky-Tennessee Field Office, January 11, 2002.

⁷ Critical habitat has been established within the park for these species.

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Cumberland Johnny Darter (NP)	<i>Etheostoma nigrum ssp. Susanae</i>
Fluted Kidneyshell (NP)	<i>Ptychobranchus subtentum</i>
Greater Adams Cave Beetle(NP)	<i>Pseudanopthalmus pholeter</i>
Icebox Cave Beetle (NP)	<i>Pseudanopthalmus frigidus</i>
Lesser Adams Cave Beetle (NP)	<i>Pseudanopthalmus cataryctos</i>
Louisville Cave Beetle (NP)	<i>Pseudanopthalmus troglodytes</i>
Short's Bladderpod (NP)	<i>Lesquerella globosa</i>
Slabside Pearlymussel (NP)	<i>Lexingtonia dolabelloides</i>
Tatum Cave Beetle (NP)	<i>Pseudanopthalmus parvus</i>
White Fringeless Orchid (NP)	<i>Platanthera integrilabia</i>

Hydrology

Mammoth Cave is by far the world's longest known cave system. It is the heart of the Southcentral Kentucky Karst, which is an integrated set of subterranean drainage basins covering more than 400 square miles. The surveyed extent of Mammoth Cave currently stands at over 360 miles with potential to exceed 1,000 miles. There are more than 200 other caves within the park which are disconnected fragments of the larger system or associated with local drainage features. The geology and geography of the area has resulted in a variety of karst basins, which have become the most thoroughly understood conduit-flow aquifers in the world.

The park is bisected east to west by the Green River, which defines the hydrologic base level and divides the region into two distinct physiographic areas. North of the river an alternating series of limestones and insoluble rocks are exposed with the main limestone strata accessible only near the river and in the bottom of a few deeply incised valleys. This has resulted in rugged topography with streams that alternately flow on insoluble rocks, over waterfalls, enter caves in limestone, and resurge at springs perched on the next lower stratum of insoluble rock. The caves are numerous but are relatively smaller with smaller drainage basins when compared to Mammoth Cave. South of the Green River the surface and subsurface is defined by the Mammoth Cave karst aquifer, a component of which is the Mammoth Cave System. The complex nature of the Mammoth Cave karst aquifer is demonstrated by the number of groundwater basins, sub-basins, and intricate groundwater flow routes throughout the region. By using data from groundwater traces, we are able to identify which groundwater recharge areas contribute flow into particular points of interest, wells, springs, and caves.

The Mammoth Cave karst aquifer owes the majority of its recharge to areas outside the park boundary. This recharge, in the form of precipitation or the injection of liquid wastes, enters the aquifer through numerous sinking streams and countless sinkholes. Any practices that may have an adverse impact to water quality within the recharge area of the park can directly affect the water quality of the park.

The Mammoth Cave karst aquifer exhibits convergent flow, much like the convergent flow patterns of a dendritic surface stream system. While other aquifers may possess diffuse flow, where contaminants slowly disperse, the convergent flow of the Mammoth Cave karst aquifer will channel recharge and pollutants toward a common trunk conduit or spring.

Flow through the Mammoth Cave karst aquifer can be very rapid, on the order of 1,000's to 10,000's of feet per day. Contaminants entering the karst aquifer can thus be rapidly transported unaltered through the conduit system. The karst aquifer is very dynamic, that is, it responds nearly instantaneously to rainfall. Aquifer stage can rise 10's of feet in a matter of hours (there

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are numerous records showing stage rises of over 100 feet over the course of one day). In addition, chemical and bacteriological properties of the groundwater can change dramatically following rainfall events. These stage rises can activate high-level overflow routes between groundwater basins and thus direct flow in different directions depending upon aquifer conditions.

Because large portions of the upper Green River watershed and the groundwater basins affecting Mammoth Cave National park lie outside park boundaries, activities conducted in these areas greatly influence water quality within the park. The primary activities that influence the park's water quality include: disposal of domestic, municipal, and industrial sewage; solid waste disposal; agricultural and forestry management practices; oil and gas exploration and production, urban land-use; and recreational activities.

Air Quality

Mammoth Cave National Park is a Class I area under the Clean Air Act. Based on data collected from 1991-1999, Mammoth Cave National Park ranks as the third most polluted National Park in the United States. The measures used in developing the ranking were visibility, ozone, and acid precipitation.⁸

Mammoth Cave NP currently monitors ozone, sulfur dioxide (SO₂), carbon monoxide (CO), nitric oxide (NO), total reacted nitrogen (NO_y), particulate matter (PM_{2.5} and PM₁₀), visibility (aerosol and optical), wet deposition, and volatile organic compounds (VOC). The EPA designated Edmonson County, Kentucky, as a non-attainment area for ozone in 1990 after recording six violations of the 1-hour ozone National Ambient Air Quality Standard (NAAQS) from 1987 to 1989. Edmonson County, Kentucky, was re-designated as attaining the ozone NAAQS in 1995, following six years of measurements below the ozone NAAQS. The worst air quality days typically occur in winter because of low boundary layer conditions, and summer due to stagnant air masses.

Soils

Of the eleven soil orders recognized, three are dominant in Mammoth Cave National Park. Most parent material is locally derived with minor influence from loess deposited during the last glaciation. On limestone substrates, Alfisols have developed which have a high base supply due to the underlying carbonate rock. Acid soil conditions still develop due to leaching of cations by rainwater, the natural production of carbon dioxide from biological activity, and weathering of aluminum from clay. However, calcium is replenished via root uptake, transfer to leaf litter, and ultimate deposition in soil via decomposition. On sandstone, shale, and conglomerate strata, Ultisols characterized by a low base supply have developed. The parent material derived from these clastic strata lack the calcium and magnesium ions of the carbonate associated soils, and therefore very acid soil conditions develop. Both the Alfisols and Ultisols have well-formed horizons unlike the Inceptisols developed largely on younger alluvium near streams. Because of the mixed sources of alluvial material, soil acidity varies greatly from site to site, and vertically through a profile.

⁸ Polluted Parks in Peril: The Five Most Air Polluted National Parks in the United States. Compiled by Harvard G. Ayers, Appalachian State University. Boone, North Carolina. October 2000, p. 1.

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Some sites, such as sandstone cliff margins dominated by pines, and steep limestone cedar-oak glades have a patchwork of exposed bedrock and thin soil. In karst valleys, soil cover over bedrock varies from absent to tens of feet over short distances due to soil piping, epikarst development, and accumulation of colluvium in sinkholes.

CULTURAL RESOURCES

The cultural time line for the park covers 10,000 years of human history and extends prehistorically from the Paleo-Indian Period to the Middle Mississippian Period. The historic period begins with Early Settlement 1774-1825, and continues through the Depression Era 1929-1941. Representing these periods are 1,112 archeological sites (prehistoric and/or historic), and 28 historic structures on the surface and in the cave. Most of the structures and some sites have been evaluated for their National Register eligibility and of those evaluated, eligible structures and sites have been listed.

The War of 1812 Saltpeter Works in Mammoth Cave are considered the park's most significant historic structures. Remains include leaching vats, a pump tower base, and an extensive water pipe system made out of hollowed logs. Other important historic structures include stone tuberculin huts (circa 1842), steam engine number four and coach (circa 1900), and Civilian Conservation Corps structures (circa 1937). Few structures remain from the period before establishment of the park. These structures include three churches (circa 1900) and the Floyd Collins House and Ticket Office (circa 1926).

One of the more significant archeological sites is the Salts Cave Vestibule. The study of this and other cave sites has convinced scientists that park caves and rock shelters were extensively utilized by prehistoric people from the Late Archaic through the Early Woodland Periods. The cave environment has preserved materials that would otherwise quickly decompose in above ground areas. Textile samples and the remains of foodstuffs have provided important information about the life-ways of these early peoples.

NON-HISTORIC BUILDINGS AND FACILITIES

The majority of buildings and other facilities in the park are non-historic. Included are utility systems, the Visitor Center, Hotel, the Great Onyx Job Corps Center, warehouse, and most storage sheds and garages. Most utilities are underground and within road corridors. In cooperation with the Kentucky State Historic Preservation Office, all park structures have been evaluated using the National Register Criteria. Determinations of eligibility and ineligibility are complete and eligible structures are listed on the National Register of Historic Places. Ineligible structures are listed in Appendix B of the Mammoth Cave National Park Programmatic Agreement, which has been mutually agreed to by the park, the Kentucky State Historic Preservation Office, and the Advisory Council On Historic Preservation. Under conditions of the Programmatic Agreement, the eligibility and ineligibility listings are reviewed every five years. The most recent review was completed in August 2001. The Visitor Center, Mammoth Cave Hotel, Gift Shop, and Restaurant have been evaluated and are not considered eligible for the National Register, even under the National Park Service guidance regarding Mission 66 structures.

AFFECTED ENVIRONMENT

SPECIFIC LOCATIONS AFFECTED BY THIS PROPOSAL

With four exceptions, the work involved in this project is entirely within existing roadways and parking lots. The exceptions are the Chaumont intersection reconstruction, the Sloan's Crossing intersection reconstruction, the tour staging and hotel access road reconstruction, and the Maple Springs Road reconstruction.

WETLANDS

There are wetlands near Routes 10, 15, and 110; however, most of these areas are well outside the area of construction. There is a wetland area immediately west of the Maple Springs Road near the existing trailhead. Expansion of the road in this location is to the east away from the wetland area in order to avoid effects on this wetland. None of the sub-alternatives include activities that would fill or dredge wetlands or floodplains. If they did, then certification and permits pursuant to the Clean Water Act, Sections 401 and 404 would be required.

VEGETATION

The vegetation in the project areas is primarily second growth oak-hickory hardwood forest, which is reclaiming old fields.

THREATENED AND ENDANGERED SPECIES

The seven federal endangered mussel species known within the park are not present in or near the project area.

The Kentucky Cave Shrimp is present in base level cave streams, which receive runoff from the project areas. Runoff from the roads is channeled by drainage structures and generally goes underground along ridge sides via sinkholes. It generally passes quickly through shaft drain complexes to the base level streams.

Federally endangered Indiana bats and Gray bats are present in the project areas during warm weather. Both species hibernate in caves within and near the park. Gray bat maternity colonies also in caves; however, Gray bats are likely to forage in the project areas. Indiana bat maternity roosts are in trees with loose bark with a preference for standing dead snags. Indiana bats, therefore, are likely to roost in trees within the project areas and to forage in the project areas.

One population of Eggert's sunflower (federally threatened) was found along the north edge of the roadway at Chaumont. Because this population was adjacent to the park boundary it was also within the area affected by a Kentucky Transportation Cabinet (KYTC) project identified as Item No. 3-185.0. The KYTC project would reconstruct Kentucky Highway 70 (KY70) from Chaumont to the I-65 Interchange at Cave City. It would overlap with the park proposal to reconstruct the Chaumont Intersection. An environmental assessment was completed for this project in May 2000, and approved by the Federal Highway Administration in July 2000. The environmental assessment concluded that this population of Eggert's sunflower would be displaced by the proposed construction. Relocation was recommended to avoid adverse impacts

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on this population of Eggert’s sunflower.⁹ The park initiated informal consultation with the U.S. Fish and Wildlife Service, and prepared a biological assessment related to a proposal to relocate the Chaumont population to five plots within two different areas that were included in the park’s five-year prescribed fire plan. Previously, the park completed canopy thinning at Chaumont, as requested by the U.S. Fish and Wildlife Service, to benefit this population of Eggert’s sunflower. This population subsequently expanded and by 2001 was comprised of 1,505 stems occupying an area about 150 feet long and up to 10 feet wide. In September 2001, the U.S. Fish and Wildlife Service concurred with the conclusion that relocation of the population was not likely to adversely affect the species. The proposal included seed collection and propagation to develop plants that could be used to repopulate the Chaumont location following construction.¹⁰ In October 2001, the population was transplanted. In May 2002, the five sites that received the transplants were visited, and the transplants appeared to be well established in their new locations.

The Bald Eagle (federal threatened) may have a transient presence in the project area, but is most frequently sighted in the river valleys outside the project area. The Bald Eagle is observed most frequently from December through March each year. There are no known nest sites within the project area or within the park.

AIR QUALITY

Under the provisions of the Clean Air Act as amended in 1977 and 1990, Mammoth Cave National Park is classified as a mandatory Federal Class I Area.

GEOLOGY AND SOILS

Geotechnical exploration has been completed in the project areas.¹¹ The first 500 feet of the Maple Springs Road project (Route 110) is underlain by the Haney Limestone Member of the Golconda Formation and the remaining roadway is underlain by the Hardinsburg Sandstone Formation. Groundwater was not encountered in any of the test borings. The borings found Wellston silt loam from the North Entrance Road to the Maple Springs Research Center. Tilsit silt loam was found in the Maple Springs Research Center area. From the Research Center to the

⁹ Environmental Assessment and Programmatic Section 4(F) Evaluation: Barren and Edmonson Counties KY70 From the KY70 - KY255 Intersection at Chaumont to the KY70 – I-65 Interchange, Item No. 3-185.00. U.S. Department of Transportation, Federal Highway Administration and Kentucky Transportation Cabinet, Division of Environmental Analysis, May 2000, pp. 20-21.

¹⁰ See Mammoth Cave National Park Impact Assessment file IA-0126, “Relocate Eggert’s Sunflower Population at Chaumont.”

¹¹ See “Report of Geotechnical Exploration, Maple Springs, Project PRA-MACA 14(1).” Mammoth Cave National Park Facility Management Division Project Files, April 18, 2001. See also “Report of Geotechnical Exploration, Mammoth Cave Paving, South Entrance Road, Project PRA-MACA 10A3, 15(1).” Mammoth Cave National Park Facility Management Division Project Files, October 22, 2001. The geotechnical work was completed by the Law Engineering and Environmental Services, Inc. (LAW) under a professional services subcontract agreement issued by Parsons, Brinckerhoff, Quade, and Douglas, Inc. the primary Architectural and Engineering contractor for the projects.

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Group Campground, Lily loam was found, and Tilsit silt loam was found in the areas west of the Group Campground.

Routes 10 and 15 are underlain at various areas (in descending order) by Hardinsburg Sandstone, Haney Limestone, Big Clifty Sandstone, and Girkin Limestone. Groundwater was not detected in the borings at the time of drilling. Most borings encountered native clay soil.

WATER QUALITY AND HYDROLOGY

Relatively impermeable sandstone covers the ridgetops within the project area. Rainfall on the ridgetop is shed to the sides of the ridge or to sinkholes on the ridgetop where the impermeable strata have been breached. There is a perched aquifer on top of these sandstone layers. In some instances the perched aquifers produce wetlands. Along the ridge sides and in sinkholes within the ridge, runoff sinks directly into the cave system through shaft drains and reaches base level streams within a matter of minutes or hours in most cases. During periods of intense rainfall ephemeral surface streams form and in a few instances may carry surface water to sinks in the valley bottoms. Within the project area all runoff enters the cave system.

MIGRATORY BIRDS

There are a number of species including neo-tropical songbirds that migrate through the park in the Spring and Fall seasons. None of the priority migratory bird species (as listed in 50 C.F.R. 17.11) is known to be present within the park during their migrations or any other time.

CULTURAL RESOURCES

Much of the project area has been previously surveyed for the presence of archeological sites. The park has completed archeological surveys to ensure that the entire project area has been adequately surveyed. No cultural resources were found in the Route 10 and 15 project area. West of the Maple Springs Research Center, a prehistoric open site was located in 1999, but testing in 1999 found no significant concentration of artifacts or zone of prehistoric occupation. Monitoring by a qualified archeologist during construction, of a 250-meter long area, was recommended to ensure that any features or significant materials that may not have been located in the inventory phase are documented and recovered¹². The Kentucky Heritage Council, State Historic Preservation Officer will be consulted under the terms of the park-specific programmatic agreement with the Kentucky Heritage Council and the Advisory Council using the environmental assessment as an alternative document as provided for in 36 CFR 800.

If there are inadvertent discoveries of materials that would require consultation with Indian tribes under the Native American Graves Protection and Repatriation Act (NAGPRA), the park would complete NAGPRA consultation procedures as required by 43 CFR 10 and 36 CFR 800 before resuming work on the project.

The Maple Springs Road is a one-lane road that predates creation of the park. The road was changed somewhat by the Civilian Conservation Corps (CCC) during development of the park, ca. 1934-1942. The road was significantly altered in the early 1980's. The work included widening at several areas, grading, guardrails, culverts, and headwalls. The headwalls were

¹² Des Jean, Tom, Archeologist, Big South Fork National River and Recreation Area. Memorandum to Superintendent, Mammoth Cave National Park, April 12, 2002.

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constructed to mimic CCC built headwalls on the nearby Green River Ferry Road. Subsequent to the renovation in the early 1980’s the road was upgraded from gravel to a chip seal surface.

The State Historic Preservation Officer was consulted concerning eligibility of the Maple Springs Road as a cultural landscape as recommended by the Development Advisory Board on May 1, 2002. The SHPO responded that the Maple Springs Road is not eligible for the National Register of Historic Places, either as a cultural landscape or as a structure.¹³

NON-HISTORIC BUILDINGS AND FACILITIES

The majority of buildings and other facilities in the park are non-historic. Included are utility systems, the Visitor Center, Hotel, the Great Onyx Job Corps Center, warehouse, and most storage sheds and garages. Most utilities are underground and within road corridors. In cooperation with the Kentucky State Historic Preservation Office, all park structures have been evaluated using the National Register Criteria. Determinations of eligibility and ineligibility are complete and eligible structures are listed on the National Register of Historic Places. Ineligible structures are listed in Appendix B of the Mammoth Cave National Park Programmatic Agreement, which has been mutually agreed to by the park, the Kentucky State Historic Preservation Office, and the Advisory Council On Historic Preservation. Under conditions of the Programmatic Agreement, the eligibility and ineligibility listings are reviewed every five years. The most recent review was completed in August 2001. The Visitor Center, Mammoth Cave Hotel, Gift Shop, and Restaurant have been evaluated and are not considered eligible for the National Register, even under the National Park Service guidance regarding Mission 66 structures.¹⁴

VISITOR USE

The primary visitor use areas of the park are within the project area. Included in the area of Routes 10 and 15 are the Visitor Center, Hotel, and campground. The primary visitor activity is cave tours, which use portions of the cave system that lie underneath the Mammoth Cave Ridge, and consequently under the project area. Approximately, two million people visit the park annually, based on traffic counts. In 2001, 425,000 visitors took cave tours. At Sloan’s Pond there is a handicap accessible loop trail about 0.5 miles in length. The Locust Grove Cemetery lies about 0.25 miles west of the Chaumont Intersection. At Maple Springs, the primary backcountry access point is within the project areas as well as the Group Campground, which can accommodate up to 168 people per night.

LAND USE

All lands within the project area are within Mammoth Cave National Park. The project area is within areas designated in the General Management Plan (1983) as development zones. The project area does not include any designated Wilderness, prime farmlands, or other land use designations requiring special consideration. The related KY70 improvement project scheduled for construction in 2005 by the Kentucky Transportation Cabinet would require expansion of the

¹³ Morgan, David L., Kentucky State Historic Preservation Officer. Letter to Superintendent, Mammoth Cave National Park, May 7, 2002.

¹⁴ See letters from David L. Morgan, Kentucky State Historic Preservation Officer, dated September 27, 1999 and May 7, 2002, to the Superintendent, Mammoth Cave National Park.

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existing right-of-way under procedures specified to comply with Section 4(F.) of the Department of Transportation Act.

TRANSPORTATION

The transportation corridors included within the project area are the portions of the Mammoth Cave Parkway from Chaumont to the Visitor Center and park headquarters complex. The primary function of these roads is visitor access to the park. They do not serve as through roads connecting major population centers outside the park.

ENVIRONMENTAL CONSEQUENCES

This road improvement project is intended to provide safe access to park facilities. Much of the project involves repaving of roads and parking lots without any change in the location, function, or character of the facilities. Four elements of the project involve reconstruction. Each area of reconstruction and the repaving is, for the purposes of this environmental assessment, a sub-alternative of the proposal.

Following is a table that summarizes the probable impacts of the alternatives related to the relevant resources or resource values that may be affected by the proposed project. The need for mitigating actions, if any, is identified for each resource value. Following the table is a narrative discussion of the effects of the proposal related to each resource or resource value. Cumulative effects and impairment are also addressed. Cumulative effects are the additional actions by any entity that can reasonably be predicted to occur as a result of the proposed action. Impairment occurs when major impacts occur which have significant and usually permanent effects on park resources or values as defined in Section 1.4 of the National Park Service Management Policies 2001 (December 2000, p. 11-13).

Impacts or potential impacts have at least three important attributes: context (i.e., location in space and time), duration, and intensity or severity. In the following discussion, the terms impact, effect, and environmental consequences are used interchangeably. Impacts are direct, indirect, and/or cumulative. Impacts can be adverse or beneficial. The duration of impacts is defined as temporary (less than two years), short-term (two to five years), long-term (five to twenty years), and permanent (more than twenty years). The intensity of impacts is described using the following threshold terms: negligible, minor, moderate, major, impairment. The following descriptions of the thresholds are for natural resource issues. Analogous relative threshold factors are employed for the other issues. Negligible impacts are so minute that they have no observable effect, and parameter measurements are well within the natural range of variability. Minor impacts are detectable, parameter measurements are within the natural range of variability, but are not expected to have any long-term effects. Moderate impacts are detectable, parameter measurements are outside the natural range of variability for short periods, and changes may be long-term. Major impacts are detectable, parameter measurements are outside the natural range of variability for short to long periods, and changes may be long-term to permanent.

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IMPACT SUMMARY TABLE

RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
WETLANDS and FLOODPLAINS– Impacts would occur if wetlands are dredged or filled. In the park, wetlands on ridgetops are generally perched aquifers. There are wetlands near the project areas. Care has been taken in planning the project to avoid effects to the wetlands. The project areas do not include floodplains.						
Description of Attributes	Not present in Project Area	Adjacent to Project Area	Near the Project Area	Not present in Project Area	Not present in Project Area	Near the Project Area
Type of Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Mitigating Actions Needed: Avoid changes in project that would impact wetlands.						

VEGETATION – Expansion or change in the footprint of roads would result in removal of vegetation.						
Description of Attributes	No vegetation removal	Tree removal to widen to 2-lanes & move intersection	Tree removal to Realign Intersection	Tree removal to Realign Intersection	Tree removal to Realign Access Road	No vegetation removal
Type of Effect	No Effect	Direct	Direct	Direct	Direct	No Effect
Severity	No Effect	Minor	Negligible	Negligible	Negligible	No Effect
Duration	No Effect	Permanent	Permanent	Permanent	Permanent	No Effect
Mitigating Actions Needed: All tree removal should conform to the park “Hazard Tree Management Plan,” approved June 20, 2000. The plan specifies actions necessary to avoid taking of Indiana bats. Formal consultation with U.S. Fish and Wildlife Service was completed and a biological opinion was issued.						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
THREATENED AND ENDANGERED SPECIES – Indiana and Gray bats likely forage in the project area, and Indiana bats may roost in trees in the project area. A population of Eggert's sunflower was present in the project area at Chaumont, but has been relocated following consultation with the U.S. Fish and Wildlife Service. The Bald Eagle is seldom seen in the park and the project area. Each of the project construction areas is within groundwater basins that contain the Kentucky Cave Shrimp.						
Description of Attributes	Accident rates would continue to be above average with opportunity for spills to impact the cave ecosystem	Construction noise and tree removal. / Safe road reduces accidents and chances for spills	Construction noise and tree removal. / Safe road reduces accidents and chances for spills	Construction noise and tree removal. / Safe road reduces accidents and chances for spills	Construction noise and tree removal. / Safe road reduces accidents and chances for spills	Construction noise
Type of Effect	Indirect	Direct and Indirect	Direct and Indirect	Direct and Indirect	Direct and Indirect	Direct
Severity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Duration	Long-term	Temporary / Long-term	Temporary / Long-term	Temporary / Long-term	Temporary / Long-term	Temporary
Mitigating Actions Needed: All tree removal activities should conform to the park “Hazard Tree Management Plan” (approved June 20, 2000). This plan has been reviewed by the U.S. Fish and Wildlife Service (formal consultation) and a biological opinion issued.						

AIR QUALITY – Some amount of dust and particulates would be produced by construction during dry weather.						
Description of Attributes	No dust/particulates from construction	Dust and fine particulates from construction	Dust and fine particulates from construction	Dust and fine particulates from construction	Dust and fine particulates from construction	No dust/particulates from construction
Type of Effect	No Effect	Direct & Indirect	Direct & Indirect	Direct & Indirect	Direct & Indirect	No Effect
Severity	No Effect	Negligible	Negligible	Negligible	Negligible	No Effect
Duration	No Effect	Temporary	Temporary	Temporary	Temporary	No Effect
Mitigating Actions Needed: Dust should be controlled if it becomes an issue during construction.						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
SOILS / GEOLOGY – The primary issues are ground disturbance and erosion prevention during construction. Based on previous construction and geo-technical investigations, rock excavation, if any, would be minimal. The effect of any ground disturbance is permanent. All construction and ground disturbance proposed by this project is within existing development zones with previously disturbed soils. Drainage improvements would be made and abandoned alignments would be reclaimed.						
Description of Attributes	No additional disturbance	Widen to 2-lanes & relocate intersection—Cut and Fill	Reconfigure intersection	Reconfigure intersection	Reconfigure tour staging and hotel access	No Effect
Type of Effect	No Effect	Direct	Direct	Direct	Direct	No Effect
Severity	No Effect	Minor	Negligible	Negligible	Negligible	No Effect
Duration	No Effect	Permanent	Permanent	Permanent	Permanent	No Effect
Mitigating Actions Needed: Rehabilitate any portion of the abandoned alignments that is not used in the new configurations.						

WATER QUALITY AND HYDROLOGY – Stormwater runoff during construction could, if not mitigated, result in erosion and sedimentation.						
Description of Attributes	No Effect	Construction runoff	Construction runoff	Construction runoff	Construction runoff	No Effect
Type of Effect	No Effect	Direct	Direct	Direct	Direct	No Effect
Severity	No Effect	Negligible	Negligible	Negligible	Negligible	No Effect
Duration	No Effect	Temporary	Temporary	Temporary	Temporary	No Effect
Mitigating Actions Needed: Control stormwater runoff during construction to prevent erosion and downstream sedimentation.						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
FISH & WILDLIFE (other than threatened or endangered species) – Effects are primarily from noise and other disturbances during the period of construction in a given area.						
Description of Attributes	No Effect	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery
Type of Effect	No Effect	Direct	Direct	Direct	Direct	Direct
Severity	No Effect	Negligible	Negligible	Negligible	Negligible	Negligible
Duration	No Effect	Temporary	Temporary	Temporary	Temporary	Temporary
Mitigating Actions Needed: None						

MIGRATORY BIRDS – Effects are noise and disturbance during the period of construction. The threatened or endangered migratory bird species are not known to be present or to migrate through the park. Construction effects are expected to be temporary.						
Description of Attributes	No Construction	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery	Construction noise and physical presence of machinery
Type of Effect	No Effect	Direct	Direct	Direct	Direct	Direct
Severity	No Effect	Negligible	Negligible	Negligible	Negligible	Negligible
Duration	No Effect	Temporary	Temporary	Temporary	Temporary	Temporary
Mitigating Actions Needed: None						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
CULTURAL RESOURCES –						
Description of Attributes	No construction	Expand footprint of road – cut and fill	No Cultural Resources Present	No Cultural Resources Present	No Cultural Resources Present	No Cultural Resources Present
Type of Effect	No Effect	Direct	No Effect	No Effect	No Effect	No Effect
Severity	No Effect	Negligible	No Effect	No Effect	No Effect	No Effect
Duration	No Effect	Permanent	No Effect	No Effect	No Effect	No Effect
Mitigating Actions Needed: A lithic scatter has been located in one area along Route 110 and needs to be monitored by an archeologist during initial ground disturbance.						

VISITOR USE – Construction work will be visible to visitors. There will be traffic delays and some temporary closures with detour routes. Park enabling legislation contains specific mandate to continue cave tours and provide outdoor recreation. The availability of relatively convenient detour routes lessens the effects.						
Description of Attributes	No Construction	Closures of Group Campground and Trailhead Parking and up to one year for large vehicles, i.e., buses and horse trailers	Temporary closures with detours and traffic delays for construction	Temporary closures with detours and traffic delays for construction	Temporary closures with detours and traffic delays for construction	Temporary closures with detours and traffic delays for construction
Type of Effect	No Effect	Direct	Direct	Direct	Direct	Direct
Severity	No Effect	Minor	Negligible	Negligible	Negligible	Negligible
Duration	No Effect	Short-term	Temporary	Temporary	Temporary	Temporary
Mitigating Actions Needed: Insure the contractor performs as specified to maintain traffic flow, closures, detours with adequate signage and flagging. Give visitors advance notice through the reservation system, Internet, and other media of the traffic situation so they can incorporate sufficient lead time into their travel plans to permit timely arrival for scheduled tours.						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
LAND USE – The project will be completed within areas previously designated as development zones in the Park General Management Plan (October 1983). The proposal would not require any changes in land use or land use designations.						
Description of Attributes	Designated development zone	Designated development zone	Designated development zone	Designated development zone	Designated development zone	Designated development zone
Type of Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Mitigating Actions Needed: None. No changes in land use designation are required or needed.						

TRANSPORTATION – Construction activities may require traffic control for safety. The project is expected to result in road closures and detours and other disruption of the normal flow of traffic.						
Description of Attributes	No Construction	Closures of Group Campground and Trailhead Parking and up to one year for large vehicles, i.e., buses and horse trailers	Temporary closures with detours and traffic delays for construction	Temporary closures with detours and traffic delays for construction	Temporary closures with detours and traffic delays for construction	Temporary closures with detours and traffic delays for construction
Type of Effect	No Effect	Direct	Direct	Direct	Direct	Direct
Severity	No Effect	Minor	Negligible	Negligible	Negligible	Negligible
Duration	No Effect	Short-term	Temporary	Temporary	Temporary	Temporary
Mitigating Actions Needed: Insure the contractor performs as specified to maintain traffic flow, closures, detours with adequate signage and flagging. Give visitors advance notice through the reservation system, Internet, and other media of the traffic situation so they can incorporate sufficient lead time into their travel plans to permit timely arrival for scheduled tours.						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
SOCIAL AND ECONOMIC – Traffic disruptions would result as discussed previously and will not be repeated here. The primary effects are the construction funds that would be paid to the contractor. Delay in completing the project would produce additional failure of the road base resulting in increased future cost.						
Description of Attributes	Roads continue to deteriorate	Construction dollars effect on economy	Construction dollars effect on economy	Construction dollars effect on economy	Construction dollars effect on economy	Construction dollars effect on economy
Type of Effect	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect
Severity	Minor	Negligible	Negligible	Negligible	Negligible	Negligible
Duration	Long-term	Short-term	Short-term	Short-term	Short-term	Short-term
Mitigating Actions Needed: None						

ENERGY REQUIREMENTS & CONSERVATION –						
Description of Attributes	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Type of Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Mitigating Actions Needed: None						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
PUBLIC HEALTH –.						
Description of Attributes	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Type of Effect	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
Mitigating Actions Needed: None						

PUBLIC SAFETY – One of the primary goals of the project is to improve public safety by providing a safe roadway that is not deteriorated. The sub-alternatives were developed as specific remedies to identified public safety issues based on traffic accident analysis and studies completed by the Federal Highway Administration.						
Description of Attributes	Pavement continues to deteriorate and no change in intersection configuration	Improve safety by providing 2-lane road as called for by current standards.	Improve safety by implementing the preferred alternative for reconfiguration of the intersection	Improve safety by implementing the preferred alternative for reconfiguration of the intersection	Improve safety by implementing the preferred alternative for reconfiguration of the tour staging access	Improve safety by providing a uniform stable surface free of defects for vehicle travel.
Type of Effect	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect
Severity	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Duration	Long-Term	Long-Term to Permanent	Long-Term to Permanent	Long-Term to Permanent	Long-Term to Permanent	Long-Term to Permanent
Mitigating Actions Needed: The proposal and its sub-alternatives is the mitigating action recommended to resolve identified public safety deficiencies.						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
INDIAN TRUST RESOURCES - There are no Indian Trust Resources in the park, and the park does not have or retain any records or other information of Indian Trust resources.						
Description of Attributes	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Type of Effect	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Severity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Duration	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mitigating Actions Needed: None						

RISK OF UNANTICIPATED CONSEQUENCES – Road closures could be longer than anticipated. There are risks of accidents and spills. The effect on visitation could be greater than expected						
Description of Attributes	No Construction	Traffic greatly restricted by upgrade to 2-lanes	Closed during a portion of construction	Closed during a portion of construction	No closure needed except for paving	Closures and/or restricted use during paving
Type of Effect	No Effect	Direct/Indirect	Direct/Indirect	Direct/Indirect	Direct/Indirect	Direct/Indirect
Severity	No Effect	Minor	Negligible	Negligible	Negligible	Negligible
Duration	No Effect	Short-term	Temporary	Temporary	Temporary	Temporary
Mitigating Actions Needed: Insure that contractor stays on schedule and maintains adequate traffic control. Update visitors in advance of their visit through a variety of media.						

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RESOURCE OR IMPACT CATEGORY	Alternative A (NO ACTION)	Sub-alternative B1 Reconstruct Route 110	Sub-alternative B2 Reconfigure Sloan's Crossing Intersection	Sub-alternative B3 Reconfigure Chaumont Intersection	Sub-alternative B4 Reconfigure Tour Staging and Hotel Access Road	Sub-Alternative B5 Repave Routes 10 & 15 and Parking Lots
CUMULATIVE IMPACTS – Cumulative impacts include other actions governmental and private that can reasonably be predicted to occur as a result of the proposal.						
Description of Attributes	No Effect	Facilitates development of Cumberland Piedmont Network Learning Center at Maple Springs	Combines with other sub-alternatives and KYTC KY70 project to improve access from I-65	Combines with other sub-alternatives and KYTC KY70 project to improve access from I-65	Critical element of MACA Package 171 Visitor Center Rehab – Facilitates improvements in function of tour ticketing and staging	Combines with other sub-alternatives and KYTC KY70 project to improve access from I-65
Type of Effect	No Effect	Direct	Direct and Indirect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	No Effect	Major Beneficial	Moderate Beneficial	Moderate Beneficial	Major Beneficial	Moderate Beneficial
Duration	No Effect	Permanent	Permanent	Permanent	Permanent	Permanent
Mitigating Actions Needed: None						

ENVIRONMENTAL CONSEQUENCES OF THE PROPOSAL

The following discussion summarizes the likely effects of the proposal for each resource or resource value evaluated in this environmental assessment. In cases where the effects are the same or similar for each sub-alternative and a categorization is used that applies to the proposal as a whole. Where the severity or duration of effects differs between the sub-alternatives, the sub-alternatives are referenced in parentheses as B1, B2, B3, B4, and B5. Cumulative effects and impairment are also discussed for each resource category. Cumulative effects are the additional actions by any entity that can reasonably be predicted to occur as a result of the proposed action. The meaning of impairment is spelled out in the National Park Service (NPS) Organic Act of 1916 (16 USC 1); the NPS General Authorities Act of 1970, including amendments in 1978 (16 USC 1a-1); and the NPS Management Policies 2001 (Section 1.4). Impairment means impact(s)

“that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.”¹⁵

WETLANDS AND FLOODPLAINS

There are wetlands near the project areas, but the project does not include work that would effect the wetlands. The primary wetland areas involved are along Route 15 just west of Locust Grove Cemetery and west of Route 110 near the existing trailhead parking area. At Locust Grove the work is repaving with no expansion of the footprint of the roadway. Route 110 has been planned to avoid affecting the nearby wetland. The project does not involve any areas in or near floodplains. The proposal is not expected to effect wetlands or floodplains.

The no action alternative would not effect wetlands and floodplains.

Impairment. The proposal and the no action alternative would not impair wetlands or floodplains.

Cumulative Effects. There are no cumulative effects on wetlands or floodplains.

VEGETATION

Trees would be removed at the Chaumont Intersection and at the Sloan’s Crossing Intersection because of the need to change the footprint of the roadway to achieve uniform curves that improve safety of travel in these areas. Along Route 110, the footprint would be increased to accommodate the change from one to two lanes. These areas are covered primarily by second growth hardwoods mixed with eastern red cedar. Reconfiguration of the tour staging and Hotel access road would be located in the maintained lawn areas adjacent to the Visitor Center and Hotel, and would require removal of 10-15 trees. Any portions of the existing roadways that are abandoned would be reclaimed. The effects range from negligible (B2-B5) to minor (B1), but the effects within the reconfigured roadways are permanent.

¹⁵ National Park Service Management Policies 2001, Section 1.4.5. December 2000, p. 12.

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The no action alternative would not affect vegetation.

Impairment. The proposal and the no action alternative would not impair vegetation or natural processes.

Cumulative Effects. There are no cumulative effects on vegetation because of the proposal or the no action alternative.

THREATENED AND ENDANGERED SPECIES

Indiana and Gray bats (endangered) are likely to forage in the project area, and Indiana bats may roost in trees in the project area from April 1 through November 15 annually. The potential effects from construction include tree removal, noise, and other direct disturbance of the bats. The park has developed a Hazard Tree and Vegetation Management Plan in consultation with the U.S. Fish and Wildlife Service that specifies conditions for removal of trees to prevent the inadvertent taking of Indiana bats.¹⁶

A population of Eggert’s sunflower (threatened) was present in the project area at Chaumont. This population was relocated in October 2001 following completion of consultation with the U.S. Fish and Wildlife Service. Therefore, no adverse effects are unlikely in respect to Eggert’s Sunflower.¹⁷

The Bald Eagle (threatened) has a transient presence in the park, but is seldom seen in the project area. No effects are expected related to the Bald Eagle.

Each separate area of the proposal is within groundwater basins that contain the Kentucky Cave Shrimp (endangered). The potential effects are related to runoff from the construction areas. Adequate controls are needed to prevent erosion and sedimentation as well as to capture any spills of hazardous materials. The changes in the roadway alignment should result in fewer motor vehicle accidents, which would significantly reduce the probability of hazardous materials spills entering the groundwater basins within the park.

The proposal does not include any areas near the Green River, which provides habitat for seven species of endangered mussels.

The proposal is not likely to adversely effect threatened and endangered species.

The no action alternative would not adversely effect threatened and endangered species.

Impairment. The proposal and the no action alternative would not impair threatened and endangered species.

¹⁶ See Mammoth Cave National Park Standard Operating Procedures Handbook, Section H. Chapter 1. See also Mammoth Cave National Park Impact Assessment file IA-0003, “Revise Hazard Tree and Vegetation Management Plan.”

¹⁷ See Mammoth Cave National Park Impact Assessment file IA-0126, “Relocate Eggert’s Sunflower Population at Chaumont.”

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Cumulative Effects. Beneficial changes in water quality are likely to be produced by the reconstruction of KY70 between the park boundary and I-65 at Cave City, which is scheduled to begin construction in 2005. This is a related project. It could be argued that it is not a cumulative effect because it is expected to be completed without regard to the choice between alternatives considered in this document. Nevertheless, for purposes of this document, it is accepted that the effects are cumulative.

The entire area of this future Kentucky Transportation Cabinet (KYTC) project is entirely within groundwater basins that are headwaters for base level cave streams within the park that provide habitat for the Kentucky Cave Shrimp. The short-term construction effects for the park are expected to be negligible. In the longer term, the KY70 project is expected to result in a safer roadway with fewer accidents that could result in spills of hazardous materials. The park has requested and KYTC has agreed to incorporate best management practices for stormwater runoff management and spill containment in the design of the KY70 project. In general, the long-term effects of the KY70 project on water quality and consequently on the Kentucky Cave Shrimp are expected to be negligible, beneficial, and permanent.

In July 2000 KYTC completed an environmental assessment, which concluded in relation to aquatic ecosystems and water quality that no significant impacts are expected. The July 2000 environmental assessment specifically states:

“Because of the unique importance of area groundwater feature, extraordinary measures will be employed on this project to substantially improve protection of the area groundwater systems and guard against adverse impacts during and after construction. These measures will include enhanced construction period erosion control practices to prevent sediment from leaving the construction areas and entering subterranean conduits. They will also include the construction of permanent spill retention amenities to contain accidental and potentially catastrophic releases of hazardous materials and prevent discharge into the environment. These amenities will remain in place after the project is completed. ... The groundwater protection conditions throughout the travel corridor will be significantly improved over existing conditions once this project is complete.”¹⁸

There are no cumulative effects associated with the no action alternative. The KY70 improvement by KYTC is a related project that is expected to be completed separately and without regard to the choice between the proposal and the no action alternative.

AIR QUALITY

The impact on air quality is expected to be negligible. The primary effects would be dust and fine particulates produced by construction activities in dry weather. Controls are required to prevent production of excessive amounts of dust. The effects are expected to be negligible and temporary.

¹⁸ Kentucky Transportation Cabinet, Division of Environmental Analysis. Environmental Assessment and Programmatic Section 4(f) Evaluation: Barren and Edmonson Counties KY70, From KY 255 at Chaumont to the I-65 Interchange, Item No. 3-185.0. Frankfort, Kentucky, May 2000, pp. 17-18.

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Impairment. The proposal and the no action alternative would not impair air quality.

Cumulative Effects. There are no cumulative effects on air quality because of the proposal or the no action alternative.

SOILS AND GEOLOGY

The primary issues are ground disturbance and erosion prevention during construction. Proper controls are needed during construction. Based on previous construction and geo-technical investigations, rock excavation should be minimal. At Sloan’s Crossing Intersection, there is an area of existing light weight fill that has a history of subsidence. A Mechanically Stabilized Earth (MSE) pad would be created using geo-textiles and stone base material to bridge this area. A MSE pad was installed under the existing roadway at that location in 1996, and has proven to be effective. The effects on geology and soils within the areas of reconstruction are negligible but permanent.

There would be no additional effects on soils and geology as a result of the no action alternative.

Impairment. The proposal and the no action alternative would not impair soils and geology.

Cumulative Effects. There are no cumulative effects on soils and geology associated with either the proposal or the no action alternative.

WATER QUALITY AND HYDROLOGY

Stormwater runoff during construction could, if not properly mitigated, result in erosion and sedimentation. There would be some replacement of existing asphalt paved ditches with concrete pavement or grass lined waterways, which is expected to result in some (probably negligible) improvement in the quality of stormwater runoff before it sinks underground. The temporary and long-term effects of the proposal are expected to be negligible.

The no action alternative would be expected to have no effect on water quality and hydrology.

Impairment. The proposal and the no action alternative would not impair water quality and hydrology.

Cumulative Effects. The separate but related KY70 improvement project that is planned for construction in 2005 is expected to result in improved stormwater runoff and spill containment along the primary visitor access route from I-65 from Cave City. There would be temporary construction effects, particularly because the project includes major reconstruction of this road. The highway improvements should result in fewer accidents on this roadway and a lower potential for spills of hazardous materials. This route is entirely within groundwater basins that feed the cave streams inside the park. (See the previous discussion related to threatened and endangered species.)

No cumulative effects are expected to result from the no action alternative. The related KY70 improvement project would proceed as planned.

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FISH AND WILDLIFE (OTHER THAN THREATENED OR ENDANGERED SPECIES)

The effects are similar to the effects on threatened or endangered species. However, abundant species would be certainly present in the construction areas and would frequently be exposed to the disturbance and noise associated with construction. The effects are expected to be negligible and temporary.

The no action alternative is expected to have no effect on fish and wildlife.

Impairment. The proposal and the no action alternative would not impair fish and wildlife.

Cumulative Effects. There would be no cumulative effects on fish and wildlife from either the proposal or the no action alternative.

MIGRATORY BIRDS

The effects on migratory birds are primarily noise and other physical disturbance. No threatened and endangered migratory bird species are known to be present or to migrate through the park. Construction is expected to produce temporary negligible effects on migratory birds.

The no action alternative is expected to have no effect on migratory birds.

Impairment. The proposal and the no action alternative would not impair migratory birds.

Cumulative Effects. There would be no cumulative effects on migratory birds from either the proposal or the no action alternative.

CULTURAL RESOURCES

Archeological survey of the project areas was completed in April 2002. Cultural resources were not found in the vicinity of sub-alternatives B2, B3, B4, and B5. West of Maple Springs the existing road was found to pass through the Maple Springs prehistoric open site. Testing in that area in 1999 found no significant concentration of artifacts or zone of prehistoric occupation. The occurrence of isolated artifacts indicates that an archeologist needs to be present during construction to direct the contractor during soil stripping in order to document and recover any features or significant materials that may not have been located during the survey.¹⁹ This site is a diffuse lithic scatter. The effects are expected to be negligible but permanent. Compliance under Section 106 of the National Historic Preservation Act is prepared as provided for in the Programmatic Agreement between the park the Kentucky State Historic Preservation Office and the Advisory Council. The Section 106 determination of effect is “no adverse effect.”

If there are inadvertent discoveries of materials that would require consultation with Indian tribes under the Native American Graves Protection and Repatriation Act (NAGPRA), the park would complete NAGPRA consultation procedures as required by 43 CFR 10 before resuming work on the project.

The State Historic Preservation Officer was consulted concerning eligibility of the Maple Springs Road as a cultural landscape as recommended by the Development Advisory Board on May 1,

¹⁹ Des Jean, Tom, Archeologist, Big South Fork National River and Recreation Area. Memorandum to Superintendent, Mammoth Cave National Park. April 12, 2002.

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2002. The SHPO responded that the Maple Springs Road is not eligible for the National Register of Historic Places, either as a cultural landscape or as a structure.²⁰

The no action alternative would have no effect on cultural resources.

Impairment. The proposal and the no action alternative would not impair cultural resources.

Cumulative Effects. There would be no cumulative effects on cultural resources from either the proposal or the no action alternative.

VISITOR USE

Construction work would be visible to visitors. Visitors will face some traffic delays and temporary closures with detour routes. The effects on visitation would be mitigated by use of all available media to keep visitors informed that delays are likely and that they should allow additional time in order to arrive in time for the desired tour departure. The effects range from temporary negligible effects (B2, B3, B4, and B5) to short-term minor effects (B1).

The no action alternative would not effect visitor use. However, it would not provide for improvements in intersections that would reduce the frequency of accidents.

Impairment. The proposal and the not action alternative would not impair visitor use.

Cumulative Effects. The proposed improvement of KY70 between the park boundary and I-65 at Cave City combined with realignment of the Sloan’s Crossing intersection (B2) and the Chaumont Intersection (B3) would provide one single visitor access road between the I-65 exit most used by visitors and the park Visitor Center. The result is expected to be a safe roadway that eliminates existing wayfinding challenges, which would be used by most park visitors. The rehabilitation of the Visitor Center (MACA Package 171) has been planned in coordination with sub-alternative B4 to reconfigure the Tour Staging and Hotel Access Road. The combined projects would result in a moderate level of beneficial improvements for visitors. The combined design would improve wayfinding, reduce congestion and confusion, and separate the tour staging function from conflicting pedestrian and vehicle traffic.

The no action alternative would not have any cumulative effects on visitor use. No action would not provide improvements in safety and visitor wayfinding.

LAND USE

The proposal would be completed within areas previously designated as development zones in the park General Management Plan (October 1983). The proposal would not require any changes in land use or land use designations. No effects are expected.

The no action alternative would not effect land use.

Impairment. The proposal and the no action alternative would not impair land use.

²⁰ Morgan, David L., Kentucky State Historic Preservation Officer. Letter to Superintendent, Mammoth Cave National Park, May 7, 2002.

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Cumulative Effects. The proposal and the no action alternative would have no cumulative effects related to land use.

TRANSPORTATION

Repaving would require traffic control to insure safety of workers and the public. The project is also expected to result in temporary road closures and detours. Commercial traffic through the park is illegal. The primary purpose of the roads is to provide visitor access to park facilities. There are no major population centers dependent on park roads as primary transportation corridors. The effects range from short-term minor effects (B1) to temporary negligible effects (B2, B3, B4, and B5). The availability convenient detour routes lessen the effects.

The no action alternative would have not effect on transportation.

Impairment. The proposal and the no action alternative would not impair transportation.

Cumulative Effects. There would be no cumulative effects on transportation because of either the proposal or the no action alternative.

SOCIAL AND ECONOMIC

In addition to the traffic delays previously mentioned, the primary social and economic issue is the construction funds that would be paid to the contractor. These funds would then enter the economy in a variety of ways. The effects are expected to be negligible and short-term.

The no action alternative would have no social and economic effects.

Impairment. The proposal and the no action alternative would not impair social and economic values.

Cumulative Effects. There is potential for cumulative effects related to improvement of access to the Maple Springs Research Center. Beginning in fiscal year 2004, the Maple Springs Research Center would become the Cumberland Piedmont Network Learning Center. The Cumberland Piedmont Network Learning Center is the first priority for National Park Service Learning Center funds in fiscal year 2004. More use of the facilities is expected to be generated, and the road improvement would facilitate that use by providing safe access. The number of partnerships related to research and monitoring of park resources and transfer of information into learning programs is expected to increase as a result of the improvements. The effects are primarily social rather than economic. The effects are expected to be moderate, long-term, and beneficial.

There are no cumulative effects expected as a result of the no action alternative. The Cumberland Piedmont Network Learning Center would proceed as planned but without improvement of the road access to the Center.

ENERGY REQUIREMENTS AND CONSERVATION

The project does not effect energy requirements and conservation.

Impairment. There would be no impairment related to energy requirements and conservation.

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Cumulative Effects. There would be no cumulative effects related to energy requirements and conservation.

PUBLIC HEALTH

The project does not effect public health.

Impairment. There would be no impairment of public health.

Cumulative Effects. There would be no cumulative effects related to public health.

PUBLIC SAFETY

Public safety is the primary goal of the proposal by providing a safe roadway that meets existing standards and is not deteriorated. Each sub-alternative was developed as a specific remedy to resolve identified public safety issues based on traffic flow and accident occurrence. The sub-alternatives are in effect actions proposed to improve public safety. Adequate traffic control and construction signage is needed during the period of construction. The effects are expected to be moderate and permanent.

The no action alternative would not effect public safety. No reduction in accidents would be expected to result from the no action alternative. Road conditions would continue to deteriorate.

Impairment. There would be no impairment of public safety as a result of either the proposal or the no action alternative.

Cumulative Effects. The proposed improvement of KY70 between the park boundary and I-65 at Cave City combined with realignment of the Sloan’s Crossing intersection (B2) and the Chaumont Intersection (B3) would provide one single road between I-65 exit most used by visitors and the park Visitor Center. The result is expected to be a safe roadway that would be used by the majority of park visitors.

There are no cumulative effects expected to result from the no action alternative. The improvement of KY70 from I-65 to Chaumont would likely proceed as planned.

INDIAN TRUST RESOURCES

There are no Indian Trust resources in the park, and the park does not have or retain any records or other information related to Indian Trust resources. There would be no effect on Indian Trust resources.

Impairment. There would be no impairment of Indian Trust resources.

Cumulative Effects. There would be no cumulative effects related to Indian Trust resources.

RISK OF UNANTICIPATED CONSEQUENCES

The risks of unanticipated consequences include longer road closures than planned, motor vehicle accidents and hazard materials spills, and a greater than anticipated effect on visitation. At worst, these effects would be minor and short-term. The risk would be mitigated by adequate contract supervision and management to insure the work remains on schedule and by use of a

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variety of media to keep visitors apprised of the construction status and the potential for traffic delays.

The no action alternative would present no additional risk of unanticipated consequences.

Impairment. There would be no impairment associated with the risk of unanticipated consequences as a result of either the proposal or the no action alternative.

Cumulative Effects. There are no reasonably discernable cumulative effects related to the unanticipated consequences of either the proposal or the no action alternative.

CUMULATIVE IMPACTS

Cumulative impacts include other actions governmental and private that can reasonably be predicted to occur as a result of the proposal. As discussed previously, the cumulative effects primarily relate to threatened and endangered species, water quality and hydrology, visitor use and public safety.

Negligible but permanent beneficial cumulative effects are expected to result from the improvement of KY70 outside the park. These beneficial effects relate to improved stormwater runoff management and a safe roadway that would produce fewer motor vehicle accidents and thereby lower the incidents of hazardous materials spills. Improved water quality would provide better protection for the Kentucky Cave Shrimp that inhabit the base level cave streams whose headwaters include the area impacted by the KY70 project.

Visitor use and public safety are expected to be improved in conjunction with the rehabilitation of the Visitor Center and the improvement of KY70 between the park and I-65. The effects on visitor use and public safety are expected to provide moderate improvements that would be relatively permanent.

Improvement of the Maple Springs Road is expected to have moderate long-term beneficial effects for development of the Cumberland Piedmont Learning Center. Safe access would contribute to the development and use of the Learning Center, which is programmed for funding beginning in 2004. The effects are primarily social rather than economic, i.e., each partnership developed enhances the opportunity for additional partnerships and improved programs. The road project would enhance use of the Learning Center by a variety of educational and research institutions.

The no action alternative is not expected to result in cumulative effects. Selection of the no action alternative would not produce improvements in public safety and visitor use. Road conditions would be expected to continue to deteriorate, and the cost for future remediation would increase.

Impairment. There would be no impairment of park resources related to the cumulative effects of either the proposal or the no action alternative.

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SUMMARY OF MITIGATING ACTIONS

The following list restates the mitigating actions identified in the preceding discussion of the likely environmental consequences of the proposal. These important conditions should be utilized to limit the potential for unexpected adverse consequences.

- All tree removal activities should conform to the park “Hazard Tree Management Plan” (approved June 20, 2000). Very few, if any, trees are expected to be removed. The park completed formal consultation with the U.S. Fish and Wildlife Service before approval of the plan. The primary issue is protection of Indiana bats. Any trees to be removed should be removed when Indiana bats are hibernating in caves (November 15th to March 31st) and therefore are unlikely to be roosting in trees.
- Dust should be controlled if it becomes an issue during construction.
- Erosion and sedimentation control measures should be in place on sites where slopes exceed 10%.
- Effective construction management and supervision should be provided to insure that public safety and other concerns related to construction are properly addressed.
- Monitoring of construction by an archeologist in the area of the diffuse lithic scatter identified as the Maple Springs open prehistoric site.

CONSULTATION AND COORDINATION

Kentucky State Clearinghouse in the Kentucky Natural Resources and Environmental Protection Cabinet (The clearinghouse distributed copies to the following Kentucky State Agencies.):

Division of Water
Division of Waste Management
Division for Air Quality
Department of Health Services
Economic Development Cabinet
Division of Forestry
Department of Surface Mining Reclamation and Enforcement
Department of Parks
Department of Agriculture
Nature Preserves Commission
Kentucky Heritage Council
Division of Conservation
Department for Natural Resources
Department of Fish and Wildlife Resources
Transportation Cabinet, Department for Military Affairs

USFWS, KY/TN Office in Cookeville, TN

National Park Service, Southeast Regional Office, Atlanta, Georgia

National Park Service, Denver Service Center, Denver, Colorado

Federal Highway Administration, Eastern Federal Lands Highway Division, Sterling, Virginia

PUBLIC INVOLVEMENT

The Draft Environmental Assessment was available for public review and comment for a period of thirty days ending on _____ 2002. A press release was issued announcing the availability of the draft document for public review. The document was posted on the park Internet site. Hard copies were available on request.

PREPARERS

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Mammoth Cave National Park

ATTACHMENTS

USFWS Concurrence
SHPO Concurrence
NHPA Section 106 documentation
Other Agency Comments and Response
Public Comments and Response

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REFERENCES

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“Final Report of the Southern Appalachian National Park Commission to the Secretary of the Interior, June 30, 1931.” United States Government Printing Office. 1931.

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